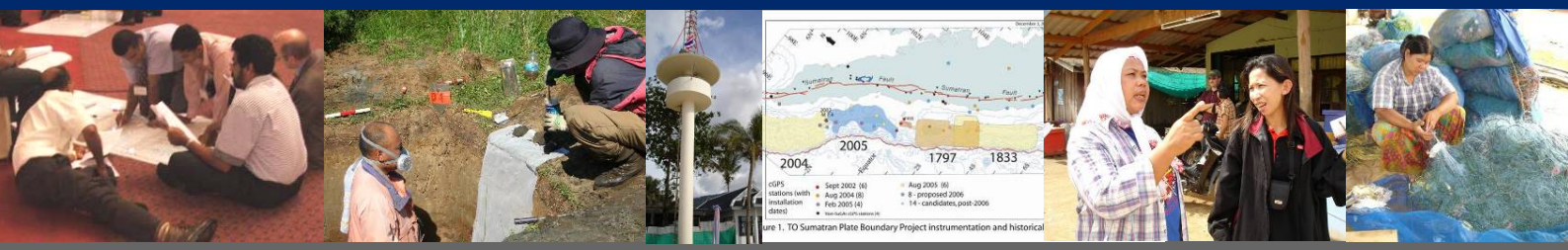
U.S. INDIAN OCEAN TSUNAMI WARNING SYSTEM (IOTWS) PROGRAM

SEMI-ANNUAL PROGRESS REPORT FY2006

August 1, 2005 to March 31, 2006



June 2006

Prepared for the United States Agency for International Development by the IRG-Tetra Tech Joint Venture

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US IOTWS Program

SEMI-ANNUAL PROGRESS REPORT FY2006
August 1, 2005 to March 31, 2006

June 2006 Version 1.0

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LIST OF ACRONYMS AND ABBREVIATIONS USED

ABM	Australian Bureau of Meteorology
ADPC	Asian Disaster Preparedness Center
ADRC	Asian Disaster Reduction Center
AIT	Asian Institute of Technology
CCOP	Coordination Committee for Geoscience Programmes
CCR	Coastal Community Resilience
CONOPS	Concept of Operations
COP	Chief of Party
DART	Deep Ocean Assessment and Reporting of Tsunami
DCOP	Deputy Chief of Party
DDPM	Department of Disaster Planning and Management
GLOSS	Global Sea Level Observing System
GTS	Global Telecommunications System
ICG	Intergovernmental Coordination Group
ICS	Incident Command System
ICT	Information and communications technology
IOC	Intergovernmental Oceanographic Commission of UNESCO
IOTWS	Indian Ocean Tsunami Warning System (as used to describe U.S. government program)
IOTWS	Indian Ocean Tsunami Warning and Mitigation System (full name of ICG for Indian Ocean, ICG/IOTWS)
IR	Intermediate Result
IRG	International Resources Group, Ltd.
JIMAR	Joint Institute for Marine and Atmospheric Research
NDMO	National Disaster Management Organization
NDWC	National Disaster Warning Center (Thailand)
NGO	Non-Governmental Organization
PCG	Project Coordination Group
PDC	Pacific Disaster Center
PI	Program Integrator (USAID contractor supporting US IOTWS Program)

PMP	Performance Management Plan
PTWC	Pacific Tsunami Warning Center
RANET	RAdio and InterNET for the Communication of Hydro-Meteorological and Climate-Related Information
RDM/A	Regional Development Mission/Asia of USAID
SOW	Statement of Work
SpO	Special Objective
TARNS	Tsunami Alert Rapid Notification System
TMD	Thai Meteorological Department
Tt	Tetra Tech, Inc.
TOR	Terms of Reference
UHSLC	University of Hawaii Sea Level Center
UNESCO	United Nations Educational, Scientific, and Cultural Organization
URI	University of Rhode Island
USAID	U.S. Agency for International Development
USDA/FS	U.S. Department of Agriculture/Forest Service
USG	United States Government
USGS	U.S. Geological Survey
USTDA	U.S. Trade and Development Agency
WAN	Wide-Area Networks
WESTPAC	IOC Sub-Commission for the Western Pacific

EXECUTIVE SUMMARY

MOBILIZING THE US IOTWS PROGRAM

This report presents a summary of activities and products developed by the U.S. Indian Ocean Tsunami Warning System (IOTWS) Program during its first eight months from August 1, 2005 through March 31, 2006. The U.S. Agency for International Development (USAID) launched the US IOTWS program in response to the December 2004 tsunami disaster. Through this two-year, $16.6 million effort, scientists and experts from the United States are sharing their technical expertise, providing guidance, and helping to build early warning system capacity within the Indian Ocean region so that governments and communities will be able to detect and prepare for tsunamis and related coastal hazards. The US IOTWS Program serves as the U.S. Government's direct contribution to the ongoing international efforts to develop the regional system under the leadership of the United Nations Educational, Scientific, and Cultural Organization's (UNESCO) Intergovernmental Oceanographic Commission (IOC).

The US IOTWS Program is promoting the development of an end-to-end integrated warning system, working primarily in the countries most affected by the tsunami—Indonesia, Sri Lanka, Thailand, India, and the Maldives. The U.S. program involves several partner agencies with specialized expertise and access to resources for the region. In addition to USAID, these agencies include the National Oceanic and Atmospheric Administration (NOAA), U.S. Geological Survey (USGS), U.S. Department of Agriculture/Forest Service (USDA/FS), and U.S. Trade and Development Agency (USTDA). USAID's Regional Development Mission for Asia (RDM/A) in Bangkok manages the program with the coordination support of a contractor that serves as the Program Integrator (PI).

The US IOTWS Program team has initiated multiple activities with counterparts at different geographic levels. For example, at a broad regional level, team members are participating through the IOC process to develop the overall regional system. At the national level the US team is working with national governments to develop systematic warning and communication procedures and systems. Similarly, at the local level, the team has launched a Coastal Community Resilience (CCR) initiative in coordination with partners to develop tools and strategies for communities to assess and improve their overall resilience and preparedness to coastal hazards.

To help achieve a sustainable IOTWS, the US IOTWS Program has invested a substantial amount of time and resources to reach out to partners within the region to identify opportunities for coordination and collaboration. The US IOTWS Program launched its website in November 2005 to serve as the primary information dissemination tool for activities and products. In September 2005 and January 2006, the US IOTWS Program invited representatives from the donor community, nongovernmental organizations, and other implementing partners to Program coordination workshop to foster information exchange and collaboration within the region.

PROGRAM PERFORMANCE TO DATE

The US IOTWS Program contributes substantively to USAID's Special Objective (SpO) 498-045 to save lives and support government-led early warning and disaster preparedness efforts in the Indian Ocean

region. There are 11 program-level indicators used to measure results. The program has already achieved several of the intermediate results and is on track to achieve its targets at the end of FY2006. Highlights of results achieved as of March 31, 2006 include the following:

Indicator 1.1: Conceptual design for early warning system design accepted. NOAA worked through the IOC's Intergovernmental Coordination Group (ICG) to present draft and final versions of conceptual IOTWS design in 2005.

Indicator 1.2: Protocols, agreements, and products developed by ICG/IOTWS member nations to ensure interoperability of the regional IOTWS system. NOAA has developed protocols for the upgrade of two sea-level stations in Indonesia, and USGS established agreements with four Indian Ocean countries to share data from seismic stations. The PI prepared the consolidated report for the IOC of the 16 national assessments conducted in 2005.

Indicator 2.1: Regional-level tsunami detection and communication system components (core stations) installed, deployed, or upgraded. In Indonesia, NOAA upgraded two sea-level stations and USGS upgraded nine seismic stations.

Indicator 2.2: National- and local-level tsunami detection system components integrated into the IOTWS and operated in accordance with IOTWS standards and criteria. NOAA integrated the two upgraded sea-level stations into larger networks. Through a USTDA-supported project, technical assistance was provided to the Thai National Disaster Warning Center (NDWC) to integrate a Concept of Operations into its warning system framework.

Indicator 3.1: Tsunami/all-hazards warning dissemination and disaster management system components designed, developed or improved at the national level. One Concept of Operations was integrated into NDWC through a USTDA-supported project.

Indicator 3.3: Number of government agencies that received technical support. US IOTWS Program team members from NOAA, USGS, and USDA/FS provided technical support to 30 central government agencies and 4 municipal agencies.

Indicator 5.1: US$ leveraged through private sector, NGO, donor and public sector resources in support of the development of an end-to-end IOTWS. Approximately $3.5 million was leveraged during this reporting period from in-kind contributions, such as salaries, donations of in-kind support from other countries and organizations, through Memoranda of Agreement (MOA) with other institutions, and through IOTWS-support activities that were the direct result of US initiatives. Many of the non-cash contributions are attributed to U.S. expertise that is being provided under the participation with IOC ICG/IOTWS working groups.

The US IOTWS Program team has focused much of its resources at the regional and national level to build awareness of the program or activity, and get buy-in from the various partners. This has set the stage for implementation and integration of these activities into the national disaster management programs. During the next six months the US IOTWS Program will be actively working with stakeholders in each of the five target countries to develop and implement the CCR initiative that will assist communities to assess and improve their resilience to coastal hazards. In addition, the small grants program was just recently approved by USAID so that in the next reporting period the small grants program will be well underway with anticipated awards for grants totaling approximately $750,000 dollars, representing the entire small grants budget.

REPORT CONTENTS

This report provides an overview of the performance accomplishments of the US IOTWS Program during its first eight months of operation, starting with general background in Section 1. Section 2 provides a narrative summary of key activities completed in that period, and Section 3 provides quantitative results through a series of annotated tables addressing each performance indicator.

This report serves as a combination of required reporting for the program overall as well as required semi-annual performance reporting for the Program Integrator, IRG-TetraTech Joint Venture under contract number EPP-I-02-04-00024-00.

SECTION 1
BACKGROUND TO THE US IOTWS PROGRAM

In response to the December 2004 tsunami disaster, the U.S. Agency for International Development (USAID) launched the United States government's Indian Ocean Tsunami Warning System (IOTWS) program. Through this two-year, $16.6 million effort, scientists and experts from the United States are sharing their technical expertise, providing guidance, and helping to build early warning system capacity within the Indian Ocean region so that governments and communities will be able to detect and prepare for tsunamis and related coastal hazards. The Program serves as the U.S. Government's direct contribution to the ongoing international efforts to develop the regional system under the leadership of the United Nations Educational, Scientific, and Cultural Organization's (UNESCO) Intergovernmental Oceanographic Commission (IOC).

Tsunamis are among the most challenging hazards to address because decisions to take emergency action must be made and executed quickly—sometimes in a matter of minutes—covering large geographic areas that span international borders. Ultimately, every "link in the chain" of a warning system is critical for saving lives.

The U.S. program involves several partner agencies with specialized expertise and technical resources for the region. In addition to USAID, these agencies include the National Oceanic and Atmospheric Administration (NOAA), U.S. Geological Survey (USGS), U.S. Department of Agriculture/Forest Service (USDA/FS), and U.S. Trade and Development Agency (USTDA). USAID's Regional Development Mission for Asia (RDM/A) in Bangkok manages the program with the coordination support of a contractor that serves as the Program Integrator (PI), a consortium of technical organizations including the Asian Disaster Preparedness Center (ADPC).

The US IOTWS Program commenced in August 2005 to provide technical assistance to the region through an integrated, "end-to-end" approach—addressing all stages of early warning from initial hazard detection and warning to community-level response. U.S. expertise is helping countries make decisions concerning strategic technology deployment at regional and national levels and is supporting extensive training and capacity building to augment detection, prediction, warning, and communication systems. In following with other U.S. Government assistance for tsunami recovery and reconstruction in the region, the Program is focusing its efforts in those

US IOTWS Program Target Countries.

countries most affected by the December 2004 tsunami—Indonesia, Sri Lanka, Thailand, India, and the Maldives.

This report presents a summary of activities and products developed by the US IOTWS Program team from August 1, 2005 through March 31, 2006. The team has conducted these activities along the continuum of an end-to-end integrated approach. For example, at the regional level, the Program has supported technical working groups of the Intergovernmental Coordination Group for the Indian Ocean Tsunami Warning and Mitigation System (ICG/IOTWS) responsible for developing the regional design and operation of the warning system. On a national level, the US IOTWS Program team is working with national governments, starting in Sri Lanka and Thailand, to develop systematic warning and communication procedures and systems. Finally, at the local level, the US IOTWS Program team has launched the Coastal Community Resilience (CCR) initiative in coordination with partners from each of the five focus countries, to develop tools and strategies for communities to assess and improve their overall resilience and preparedness to coastal hazards.

This report follows the same organization of the *US IOTWS Program Integrated Program Work Plan 2005-2007*. Below, Section 2 provides a summary of the major outputs organized by program area, followed by the specific performance management plan reporting results in Section 3. In addition to presenting the results that have been achieved from August 1, 2005 to March 31, 2006, this report also satisfies the PI's required report of contract performance to date.

Schematic showing an "end-to-end" integrated approach for the development of an Indian Ocean Tsunami Warning System.

SECTION 2
SUMMARY OF US IOTWS PROGRAM ACTIVITIES

The US IOTWS Program is organized into the following seven program areas that address regional, national, and local levels of tsunami warning system development, as well as cross-cutting support activities. These program areas include:

Regional

1. Technical Support to the Intergovernmental Oceanographic Commission (IOC)
2. Regional Hazard Detection, Observation, and Forecasting Systems

National

3. National Dissemination and Communication of Warnings

Local

4. Local Preparedness and Mitigation

Cross-cutting

5. Regional Exchanges, Training, and Information Resources
6. Overarching Program Coordination, Administrative Support, and Outreach
7. Small Grants Program

The following section provides a summary of the major activities undertaken by the US IOTWS Program as they relate to the relevant program areas.

2.1 PROGRAM AREA ONE: TECHNICAL SUPPORT TO THE INTERGOVERNMENTAL OCEANOGRAPHIC COMMISSION (IOC)

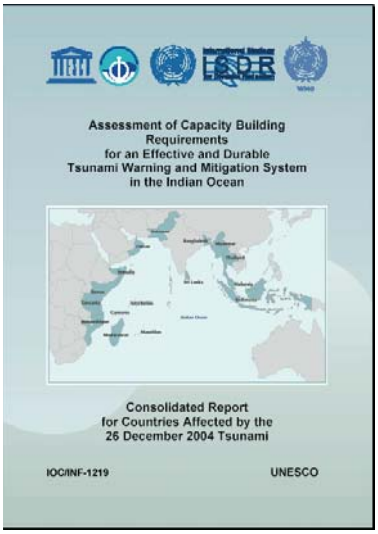
In support of the IOC, the US IOTWS Program participated in several IOC National Assessments to identify priority needs for developing tsunami national warning system components, and prepared a subsequent report summarizing the results of all 16 assessments. In addition, the US IOTWS Program team members actively participated in the United Nation's IOC Intergovernmental Coordination Group/IOTWS (ICG/IOTWS) meetings to assist in the overall conceptual design of an IOTWS, and develop common standards and protocols for data sharing and communication systems.

2.1.1 USG Participation in IOC National Assessments

Between May and September 2005, the IOC and the World Meteorological Organization (WMO) led national assessments of 16 Indian Ocean countries to determine the status, planned actions, and support requirements for improving their early warning and mitigation capacity for tsunamis and other disaster

risks. During August and September, USGS's IOTWS program coordinator, a seismologist, joined the national assessment teams to Indonesia, Thailand, Malaysia, and Bangladesh, and NOAA's IOTWS program coordinator participated in the Indonesia assessment. USAID also provided funding for the participation of a tsunami warning expert from the IOC/International Tsunami Information Center (ITIC) to the assessment in Indonesia. Expert teams worked with country representatives to complete the 136-question assessment forms and provide recommendations for strengthening capacity and potential international interventions.

2.1.2 Consolidated Report of IOC National Assessments Completed



In coordination with the IOC, the US IOTWS Program provided technical assistance to consolidate and report the results of all 16 IOC national assessments. USAID's Program Integrator (PI) contractor analyzed almost 1,000 pages of the individual national assessments and presented preliminary analyses and assessment summaries to the IOC in Paris, France during October 12–14, 2005. Participants at this meeting included the PI and representatives from IOC, the International Tsunami Information Center (ITIC), ISDR, WMO, and the Asian Disaster Reduction Center (ADRC). The working group reviewed the consolidation approach and preliminary results of the analyses, and provided input for completing the consolidated report.

The PI developed the draft and final versions of the 195-page *Assessment of Capacity Building Requirements for an Effective and Durable National Tsunami Warning and Mitigation System in the Indian Ocean: Consolidated Report for Countries Affected by the 26 December 2004 Tsunami* in close collaboration with the IOC, the ISDR, and WMO. The assessments and analysis form an important baseline for establishing the technical requirements for the IOTWS and are a critical mechanism for identifying and coordinating national and donor investments in the IOTWS. The final report was announced and distributed to regional participants at the ICG/IOTWS-II meeting in Hyderabad, India in December 2005.

2.1.3 Cross-Cutting Regional Support provided through the United Nation's ICG/IOTWS Process

A primary mechanism for providing regional-level support for the development of the IOTWS is through the ICG/IOTWS and its working groups. US Government delegations comprised of representatives of NOAA, USGS, and USAID have actively participated in the UNESCO-sponsored meetings in Mauritius and Paris leading up to the establishment of the ICG/IOTWS, as well as in the first session, ICG/IOTWS-I, held August 3–5, 2005 in Perth, Australia, and in the ICG's second session, ICG/IOTWS-II, held December 14–16 in Hyderabad, India. The ICG/IOTWS working groups (WG) each focus on a particular technical area that is relevant to the main components of the warning system, as follows:

- WG1, Seismic measurements, data collection, and exchange
- WG2, Sea level data collection and exchange, including deep-ocean tsunami detection instruments

- WG3, Risk assessment
- WG4, Modeling, forecasting and scenario development
- WG5, Establishment of a system of interoperable advisory and warning centers
- WG6 (proposed), Mitigation, preparedness, and response

In the past eight months the US IOTWS Program team members actively attended intersessional meetings of these working groups and provided critical technical input to be used for decision-making purposes. USGS helped convene the first meeting of WG1 November 10–11, 2005, in which data exchange and software compatibility for land seismic stations was discussed. NOAA has had a prominent role in supporting the meetings and intersessional activities of WG2, WG4 and WG5.

2.1.4 Conceptual Design for Regional IOTWS completed

Leading up to the inception of the US IOTWS Program, during July and August 2005 NOAA developed a draft conceptual design for an Indian Ocean Tsunami/All-Hazards warning system that was presented to the IOC and Indian Ocean country representatives at the ICG/IOTWS-I meeting in Perth, Australia. This conceptual design includes a range of options for response capacity sufficient to provide some minimal level of lead time for Indian Ocean nations through a full design that would provide maximum lead times for the region's nations. ICG/IOTWS-I working group participants agreed that the USG proposed conceptual design was a useful approach for establishing an all-hazard warning system in the region and proposed modifications to tailor it to regional requirements. A refined version of this conceptual design was presented and discussed at ICG/IOTWS-II in December 2005. Portions of the conceptual design, such as the conceptual array for deep-ocean tsunami detection stations, will continue to be updated as necessary.

2.1.5 Ongoing Interim Warning Support and Capacity Built

Since the December 26, 2004 tsunami struck Asia, NOAA's Pacific Tsunami Warning Center (PTWC), supported by data provided through USGS, has been continuously issuing bulletins and warnings on seismic activity in the Indian Ocean region. For example, the PTWC issued a bulletin after a 7.7 magnitude earthquake was detected in the Banda Sea on January 27, 2006. There was no threat of a tsunami because the event was deep inside the earth, and the bulletin language reflected that evaluation. The US IOTWS Program has supported costs for these interim warnings since the program's inception. PTWC will continue to provide interim tsunami watch information to the Indian Ocean region through the end of the project period or until the region's capacity is developed to do so independently.

2.2 PROGRAM AREA TWO: REGIONAL HAZARD DETECTION, OBSERVATION, AND FORECASTING SYSTEMS

The US IOTWS Program continued to work within the IOC process to provide technical expertise on tsunami detection, observation, and forecasting methods. In addition to supporting the IOC, the US IOTWS team members also scheduled training workshops to build capacity in the five program countries (India, Indonesia, the Maldives, Sri Lanka, and Thailand) to strengthen their all-hazards forecasting and warning capabilities. Finally, the US IOTWS Program installed and upgraded various components of the regional system such as tide gauges and seismic networks. Together, these activities

have strengthened early warning capabilities, enhanced the compatibility of data transfer across the region, increased each country's ability to interpret the data and to disseminate appropriate advisories and warnings.

2.2.1 Sea-Level Detection and Networks in the Indian Ocean Region upgraded

Through March 31, 2006, NOAA upgraded two sea level stations in Sabang and Sibolga, Indonesia, on the island of Sumatra, to improve the ability of Indonesia to detect rapid changes in sea level caused by tsunamis. These stations were upgraded in support of the IOC's Global Sea Level Observation Station (GLOSS) station network expansion effort through NOAA's partnership with the University of Hawaii Joint Institute for Marine and Atmospheric Research in December, 2005. As GLOSS stations, these gauges meet the standard of providing operational, real-time data to the WMO's Global Telecommunications System (GTS). Through GTS, all Indian Ocean countries with GTS access can receive these data for detection, analysis, and forecast purposes. An additional nine stations are planned to be upgraded during the next reporting cycle to augment the 26 station upgrade/installation program funded by the IOC and other donors.

By establishing real-time GLOSS sites in the eastern Indian Ocean in conjunction with upgrades to existing real-time GLOSS sites in the central and western Indian Ocean areas, NOAA has enabled the Pacific Tsunami Warning Center (PTWC) and the Japan Meteorological Agency (JMA) to provide basic regional tsunami advisories that are directly applicable to the Indian Ocean region. This system will allow other Indian Ocean tsunami warning centers to start increasing the *in situ* sea level data stream necessary for regional tsunami warning and monitoring. In addition, one important contribution of the US team has involved efforts to promote the commitment of IOTWS nations to routinely provide free and open exchange of real-time sea-level data on the GTS and to provide historical data and metadata for the designated IOTWS sites in their country.

2.2.2 Deep Ocean Assessment and Reporting of Tsunamis (DART) Technology, Production, and Deployment Options Provided to International community

As part of the US IOTWS Program, NOAA and its partners have provided extensive technology transfer support on Deep-Ocean Assessment and Reporting of Tsunamis (DART) buoy systems which NOAA developed for the US tsunami detection array in the Pacific. To date, NOAA's DART buoys remain the only proven deep-ocean tsunami detection technologies to be serving on a fully operational basis. However, in order to allow greater utilization of DART technologies in the Indian Ocean and elsewhere, NOAA released nearly all technical specifications and schematics to the public in August 2005—with the remainder released in January 2006—to assist both other governments and the private sector to begin developing and applying the technology on their own. NOAA also provided assistance on potential siting of systems in the Indian Ocean region, deployment, standards, and operation and maintenance requirements, primarily through ICG/IOTWS WG2.


D. MCKINNIE, NOAA

NOAA's DART II system includes a surface buoy and bottom pressure recorder to provide timely information used to detect, measure, and report the presence of tsunamis.

2.2.3 Terms of Reference Guidelines for DART Requirements Developed

Prior to the WG2 meeting at ICG/IOTWS-II in Hyderabad, India in December 2005, representatives from NOAA and Australian Bureau of Meteorology (BoM) met in Montreal, Canada to draft the Terms of Reference (TOR) to guide future collaborative efforts on DART standards, buoy location, and operation and maintenance requirements in the Indian Ocean region under the auspices of WG2. It is expected that this agreement will become a model for global DART operations and will contribute significantly to building capacity of the Indian Ocean region. The TOR was formally adopted by WG2 during its Hyderabad meeting.

2.2.4 Cost Estimate Analysis for Production Costs of DART II and DART II ETD Buoys Completed

During 2005, Indian Ocean governments made numerous inquiries about the possibility of "purchasing" US DART buoys, and about development costs necessary for potentially planning their own deep-ocean buoy programs. In March 2006, NOAA held internal discussions on the manufacturing of the DART buoys and the timing of their deployment, the U.S. decision-making role for implementing Indian Ocean DART buoys, and the timing and extent of the transfer of technology and expertise to an Indian Ocean partner. In related efforts, NOAA also held informal discussions with Thailand and Indonesia regarding deployment and long-term maintenance of the proposed DART II buoys NOAA will contribute under the IOTWS program. Part of the cost analysis provided critical information that will help determine the most cost-effective and financially sustainable approach of different models for DART partnerships in the Indian Ocean.

2.2.5 Needs Assessment for Seismic Detection Systems Conducted

Representatives from USGS met with the Thai Meteorological Department and the NDWC in February 2006 to assess Thailand's needs regarding seismic station installation, upgrade, network configuration and communication enhancements. Data sharing was discussed and a letter of intent was drafted outlining specific tasks. Similar discussions have taken place between the USGS and the Indonesian Meteorological and Geophysical Agency (BMG) in Indonesia with final upgrade plans expected in the early summer 2006. Sri Lanka and the Maldives do not presently have the technical capacity or need to create a seismic network, as they would benefit most from upgrades around the region. India, likewise, has its own network, and it will be an ongoing aim of this work to encourage data sharing among the other countries.

2.2.6 GTS Upgrades to Provide Basic Regional Tsunami Advisories and Monitoring to Indian Ocean Nations

One of the goals of the IOC national assessments was to identify issues related to the GTS and other aspects of multi-hazards warning that fall within the ambit of WMO. Building on the country assessments, NOAA and the Pacific Disaster Center conducted a communications survey with the Thai NDWC to prepare for the Wide Area Network (WAN) upgrades identified in NOAA's implementation plan. NOAA met with Maldives Government staff and officials in February 2006 to collect information for GTS upgrades.

NOAA also completed the report, "Indian Ocean Tsunami Warning System – Report on Existing Meteorological Telecommunication Systems in the Indian Ocean Region" on the status, shortcomings, and vulnerabilities of communication systems in the Indian Ocean with a primary focus on the Maldives and Sri Lanka. Finally, NOAA prepared the first draft of the GTS upgrade plan for Sri Lanka and Maldives in coordination with WMO.

2.2.7 Seismic Station Upgrades Initiated to Existing Network on Sumatra and Adjacent Islands

USGS, in collaboration with BMG in Indonesia, downloaded data from field instruments, and maintained and repaired existing instrumentation and addressed incidences of station vandalism and theft of equipment. These changes should help to ensure the long-term viability of the Indonesian seismic network, and in turn the reliability of the IOTWS.

2.2.8 Capacity to Establish Standards and Protocols for Seismic Warnings Increased

USGS and NOAA participated in the intersessional meeting of ICG/IOTWS WG1 on Seismic Measurements, Data Collection and Exchange in Jakarta, Indonesia on November 10–11, 2005. Representatives from Sri Lanka, Thailand, and Indonesia were present at the discussions. (The Maldives presently lacks seismic monitoring capacity, and therefore was not present.) The discussion focused on building an Indian Ocean Regional Seismographic Network, which will be a main component of the IOTWS. WG1 also developed Recommendations for Action by member states related to data sharing, regional seismic networks, and specific capacity building requirements and standards.

2.2.9 Paleoseismology Training and Research Exchange Conducted

The US IOTWS Program sponsored a three-week paleoseismology training for four Sri Lankan, Indonesian, and Thai geologists to Santiago, Chile during January 25–February 17, 2006. USGS worked with these geologists to uncover and examine diverse geologic expressions of tsunamis and earthquakes from the past two thousand years. The participants focused on identifying the special conditions where tsunamis leave lasting landforms and deposits to later be able to apply these principles in the Indian Ocean region. USAID sponsored the travel costs for the four geologists.

B. ATWATER, USGS

Sri Lankan geologists use entrenching tools to unearth signs of unusually large tsunamis near Maullín. Chile.

2.2.10 Training on Earthquake and Tsunami Geology Conducted

Through the US IOTWS Program, the USGS conducted training for scientists and engineers on using coastal geology to identify and define tsunami hazards. The training took place January 10–12, 2006 at the Asian Institute of Technology. More than 200 scientists, professors, and students attended.

2.2.11 Data Sharing Capacity within the Indian Ocean Region Expanded

NOAA signed an agreement in March 2006 with the Australia Bureau of Meteorology for improved meteorological and hydrological forecasting in the Indian Ocean and South Pacific regions. The agreement is a mutual exchange of scientific and technical expertise to enhance both countries' capabilities in delivering the most sophisticated forecasting data available. Although not a direct activity of the US IOTWS Program, the technology partnership with Australia complements US support for UN-led efforts to develop the IOTWS and other international warning systems, and will accelerate Australia's capacity for planning, deploying, and operating tsunami detection systems, such as deep-ocean buoys, as a critical part of the IOTWS development.

2.3 PROGRAM AREA THREE: NATIONAL DISSEMINATION AND COMMUNICATION OF WARNINGS

Moving along the spectrum of the end-to-end regional warning system from the regional to the national level, National Disaster Management Organizations (NDMOs) are challenged with interpreting the seismic and oceanographic data received, and communicating warnings, if any, out to the threatened communities. This requires that established procedures and policies are in place at the national level to communicate the information, but policies must also be developed for responding to any warning messages. The US IOTWS Program begun to provide valuable support to national governments to help develop these procedures. By focusing on pilot countries, the team will use the lessons learned and apply the same procedures and techniques to other countries in the Indian Ocean region. The US IOTWS Program provides various tools and techniques for warning dissemination such as national preparedness and response strategies, rapid notification systems, and warning communication technology.

I. LEWIS, NOAA

On Patong Beach in Phuket, Thailand, lifeguards play an important role in the Thai early warning system. The TARNS Project will help improve protocols and communications procedures to ensure the people on the beach get warnings and are moved to safety.

2.3.1 Development of Incident Command System (ICS) Framework for Sri Lanka Initiated

Through discussions in October and December 2005, the USDA/FS received a commitment from Sri Lanka's Disaster Management Center (DMC), led by Major General Gamini Hettiarachchi, to partner with USDA/FS on an initiative to develop ICS capabilities in the country, modeled after US efforts over the past 30 years, and more recent introduction of ICS to India and other developing countries around the world. With USAID and PI support, USDA/FS implemented a brainstorming workshop in January 2006 attended by almost 50 representatives from national and municipal government agencies, academia, and non-governmental organizations (NGOs). Follow-up meetings with USAID/Sri Lanka and the DMC in January 2006 helped to begin the process of integrating ICS into Sri Lanka's disaster response system. The key result of the brainstorming session was the Sri Lanka Government's decision to take steps to adopt ICS as a critical component of its disaster management programs, including tsunami warning. During the next two reporting periods, USDA/FS will be implementing a series of train-the-trainer

programs, a study tour to the US to experience ICS during a real emergency, simulation exercises, and a regional workshop to share the ICS experience in the region.

2.3.2 Development of Concept of Operations (CONOPS) Initiated for Improved National Warning Center Capacity

NOAA participated in a WMO workshop in early November 2005 in Singapore on the development of a CONOPS for 24/7 multi-hazard early warning center capabilities in the Indian Ocean. This workshop was an important mechanism to coordinate NOAA's plans for CONOPS development with the international community in general. Any multi-hazards system development for the region must fit with the WMO's existing operational structure, systems, and protocols. As a result, this meeting set the stage for a ICG/IOTWS WG5 intersessional meeting immediately afterwards that developed the first WG 5 interoperability concepts that were presented at ICG/IOTWS-II in Hyderabad.

2.3.3 CONOPS Developed for Thai National Disaster Warning Center

The Pacific Disaster Center, through a USTDA-funded grant under the US IOTWS Program, hosted a CONOPS workshop on February 17, 2006 to help refine the decision-making process of the Thai NDWC in issuing early warnings. In the context of supporting the Thai NDWC, CONOPS refers to the flow of information and decision support mechanisms for generating early warnings, as well as critical "focal points" for all key domestic and international organizations that are needed to work with Thailand's warning center to provide disaster-related data and information. The workshop helped Thai government participants identify opportunities to broaden the CONOPS approach to address all hazards, increase collaboration among Thai ministries, and offering training to disaster management organizations. Additional project deliverables includes an information communications technology gap analysis report, a business continuity plan for NDWC and basic training materials required to conduct "train-the-trainers" sessions.

2.3.4 Tsunami Alert Ready Notification System (TARNS) Program Launched in Thailand

In September 2005 the US IOTWS Program initiated consultations with NDWC on US-Thailand cooperation to develop TARNS, an initiative to establish procedures for comprehensive government coordination and warning communications from the national to the local level. US IOTWS Program team members conducted field visits in Ranong and Phuket provinces to better understand the operational aspects of the warning system established by the Thai government since the tsunami. The feedback from these meetings was then used to refine the scope of the proposed TARNS initiative and develop a Memorandum of Agreement (MOA) between USAID and the NDWC, signed March 24, 2006 by Dr. Plodprasop Suraswadi, NDWC Executive Director, and Mr. Timothy Beans, USAID RDM/A Mission Director. The TARNS initiative will help NDWC develop and implement a "master plan" covering technologies and procedures to deliver both disaster warnings and "all clear" alerts

J. LEWIS, NOAA

TARNS team interviewing a volunteer in Ban Phukhao Thong, Thailand

quickly and efficiently, and will involve nation-wide simulation exercises. It is expected that Thailand's experience with TARNS will serve as an important model for other Indian Ocean countries to adopt. Two TARNS trainings and initial assessments of TARNS integration with Provincial and local authorities are planned during the next six month period.

2.3.5 Grants Signed by USTDA to Strengthen National Disaster Warning Centers

USTDA has committed more than $2 million in assistance that is providing U.S. private sector advisory expertise for four planning studies in Sri Lanka, Indonesia, and Thailand. As of March 31, 2006 two USTDA-funded grants have been signed between national governments and project implementers. The first grant was signed with Thailand, where the NDWC-selected contractor, the Pacific Disaster Center (Hawaii), began work in late 2005 on the Disaster Warning Systems Integration and Capacity Development Project. The second grant was signed with the Meteorological and Geophysics Agency (BMG) in Indonesia. These activities target priorities for developing national disaster warning centers in each country, including information technology systems that quickly integrate scientific and warning data with emergency communications systems, as well as the management practices that work effectively in such centers.

These projects are making an important contribution to national-level technical assistance related to emergency communications systems and an integrated communications backbone for early warning systems, disaster mitigation, and risk management in the affected countries. USTDA continues to work closely with other USG technical agencies to ensure that activities are closely coordinated with related US IOTWS Program activities, and to identify and support additional projects in the region.

2.3.5 Opportunities Identified for RANET Warning Communication Systems in Sri Lanka and the Maldives

In January 2006, NOAA met with a number of Sri Lankan government agencies and potential NGO partners related to the design and deployment in Sri Lanka of RANET (RAdio and InterNET for the Communication of Hydro-Meteorological and Climate-Related Information). RANET is a low-cost system of battery-powered radios receiving internet information via satellite for use in locations without reliable communications or during disasters. Discussions with NGO representatives and potential implementation partners such as the Information and Communications Technology Agency (ICTA) and the Sri Lanka Meteorological Service helped to integrate radio and internet coverage, institutional capacity, and deployment priorities. Based on discussions with the Director and Deputy Director of the Sri Lanka Meteorological Service, all of the platforms used by RANET will have applicability and the satellite systems could serve as vital links to district level offices and police stations. In March of 2006, NOAA also met with the Meteorological Department of the Maldives to discuss possible adaptation of the RANET technology for that country and potential communication upgrades in the country as part of the GTS upgrade activity for the Maldives. (See 2.2.6)

2.4 PROGRAM AREA FOUR: LOCAL PREPAREDNESS AND MITIGATION

The final piece in an all-hazards end-to-end system focuses at the local level to ensure that communities are prepared for potential coastal hazards and have the ability to adequately respond to these hazards. This preparation includes both integrated coastal management to mitigate the affects of coastal hazards, as well as knowing how to respond to a warning by following established procedures. The US IOTWS Program team has launched a comprehensive Coastal Community Resilience (CCR) Initiative that will include a strong coastal mitigation component and can be adapted to various communities.

S. ROSS, USAID RDM/A)

Under the CCR initiative, communities will be trained to become more resilient to natural hazards such as tsunamis, floods, landslides, cyclones, and earthquakes.

2.4.1 Field Visits conducted to Develop Approach for Coastal Community Resilience (CCR) Initiative

Under the CCR Initiative (changed from "TsunamiResilient Communities" to "Coastal Community Resilience" to more effectively capture the full range of activities required for tsunami resilience), NOAA, USAID, and the PI, including ADPC and the University of Rhode Island (URI), will help coastal communities adopt common benchmarks and best practices in building resilience to tsunamis and other coastal hazards. The initiative will engage key national and local officials, NGOs, and other stakeholders in the process of developing community resilience guidelines and training materials, and conduct on-the-ground training for practitioners that focus on community implementation of community resilience elements in all five focus countries. During the program's September 2005 initial scoping visits to each focus country, the lack of a coherent and consistent approach to strengthening coastal disaster preparedness was a repeated theme. In February and March 2006, NOAA, USAID, PI and ADPC conducted additional field visits in Thailand, Sri Lanka, and the Maldives to begin gathering information for establishing CCR programs in those countries, with additional trips to Indonesia and India to follow. During these visits, the team presented proposals for CCR country-level implementation activities, and identified priority opportunities and challenges for promoting coastal community resilience. NOAA and ADPC also visited several fishing villages in Ranong Province in Southern Thailand as part of the initial phase of the CCR Program. USAID is already supporting post-tsunami recovery in these villages through USAID RDM/A's Post-Tsunami Sustainable Coastal Livelihoods Program. In its next phase, the CCR will expand to regional and country-level stakeholder workshops to design the program approach and guidelines in response to country-specific conditions, challenges, and priorities.

2.4.2 Validated Inundation Modeling Results for Hazard Map Development

Under the US IOTWS Program, URI and its Asian university partners have been jointly developing practical tools to identify the most at-risk communities in the Indian Ocean region. In March 2006, oceanographers from URI and Chulalongkorn University of Thailand visited the most severe tsunami-affected areas of Phuket Island to compare actual damage with computer model results based on maps

of the ocean bottom and modeled wave height and shoreline inundation. To establish the validity of the predictions, the team visited the sites where the largest waves were reported and precisely calibrated the heights and distance inland that the waves traveled. In several cases, the actual waves were higher and farther-reaching than the model predicted—*some over 10 meters*. These results highlight the relative degree of risk along shorelines as determined by offshore and near-shore bathymetry, and will be used to better plan redevelopment in the most vulnerable locations, including some sites struck by the December 2004 tsunami where rebuilding is underway. This study is being shared with partners in the field who are assisting communities to become better prepared for all coastal disasters.

2.4.3 Regional Post-Tsunami Lessons Learned Workshop Jointly Sponsored for Sustainable Coastal Management

The US IOTWS Program participated in and jointly sponsored with the USAID-funded Post-Tsunami Sustainable Coastal Livelihoods Program, the "Post-Tsunami Lessons Learned Workshop for Sustainable Coastal Management" at the AIT Center in Bangkok, February 15–17, 2006. This regional workshop included 23 local community practitioners from India, Indonesia, Maldives, Sri Lanka, Thailand, and Vietnam in addition to workshop organizers and invited experts. The workshop was the first of two regional events of the Livelihoods Program to share lessons from the affected post-tsunami countries on how to support sustainable coastal management in the wake of the tsunami disaster. The PI sponsored four regional participants to attend (these are the same attendees from the workshop described in section 2.4.4).

2.4.4 Participation in IOC/WESTPAC Workshop on Post-Disaster Assessment and Monitoring

USAID and the PI coordinated with the IOC Sub-Commission for the Western Pacific (IOC/WESTPAC) to participate in a workshop on "Post-Disaster Assessment and Monitoring of Coastal Ecosystem, Biological and Cultural Diversity in the Indian Ocean and Asian Water" in Phuket, February 20–23, 2006. The event included nearly 200 experts and officials from international organizations, Asian governments, NGOs, and local communities. The PI supported four participants to attend the workshop and presented a paper in the plenary on the linkages between integrated coastal management (ICM) and disaster preparedness in the Indian Ocean region—the first opportunity to vet with regional stakeholders the concept of integrating the two disciplines for what is now the CCR initiative.

2.5 PROGRAM AREA FIVE: REGIONAL EXCHANGES, TRAINING, AND INFORMATION RESOURCES

There are various cross-cutting program activities that support the efforts described in the previous sections. These activities include the development and conduct of regional exchanges, workshops, and training on the core program area activities among the target countries. This is critical to increase the regional impact of the US IOTWS Program by seeking to replicate lessons learned and to share best practices within and among the five target countries. As of March 31, 2006, more than 365 participants have attended US IOTWS Program-sponsored workshops and trainings.

The PI has provided logistical and technical support for the exchanges and trainings to enable disaster management specialists from the five target countries to attend the trainings so that they can apply these

concepts to improve their disaster management capabilities. While training activities were still largely in the planning and approach phase during this first reporting period, support has included organizing the ICS training in Sri Lanka in January 2006, and joint sponsorship of the "Post-Tsunami Lessons Learned Workshop for Sustainable Coastal Management". In addition, the PI sponsored 4 Indian Ocean geologists to participate in three-week paleoseismology training in Chile and sponsored 4 participants to attend the "Post-Tsunami Lessons Learned Workshop for Sustainable Coastal Management" in Bangkok.

Many different types of information resources have been developed to reinforce the concepts and technical content that has been presented in the various workshops and trainings. These materials are presented and archived on the US IOTWS Program web site. For example, after each workshop the presentation materials are posted along with a summary of the meeting to provide a resource for the participants to use the information in the future. Examples of resources that have been developed for this program are presented in the following section.

2.6 PROGRAM AREA SIX: OVERARCHING PROGRAM COORDINATION SUPPORT, ADMINISTRATION, AND OUTREACH

2.6.1 Project Management Organization

In September 2005, the US IOTWS Program PI Chief of Party (COP) and Deputy Chief of Party (DCOP) initiated arrangements for establishing the Project Management Office and began to recruit and hire local staff. In September, the PI prepared materials for and facilitated a three-day kick-off meeting with USAID and all USG agencies participating in the US IOTWS Program.

In October and November 2005, the COP and DCOP participated in meetings with the two principal US IOTWS Program PI subcontractors; ADPC and the University of Rhode Island/AIT team to discuss their respective roles in the US IOTWS Program and finalize sub-contract agreements. In October, the PI's Project Management Office was established and protocols for project implementation were finalized by the COP and DCOP.

To meet emerging program staffing needs, new staff have been identified and recruited for the office in Bangkok and to coordinate local activities in the Program countries. The local coordinators will help to improve communications and coordination between the US IOTWS Program and local counterparts and to facilitate technical assistance, workshops, and exchanges. The PI has hired local coordinators for Indonesia and Sri Lanka and ADPC provides local coordinators for India and the Maldives under their sub-contract.

2.6.2 Work Plan, Communications Plan, and PMP

The work planning process began in September 2006 with the preparation of a draft work plan, communications plans, and a performance management plan (PMP). These work planning documents were finalized in November 2005. The process was lengthy in part because the US IOTWS Program involved coordinating the program responsibilities of the PI and the four USG partner agencies, thereby requiring an integrated work plan that reflects all the activities of the various implementers as well as a PMP that accounts for all results. The process was also protracted because of the need for an adaptive approach to ensure the activities of the US IOTWS Program were fully responsive to regional, national,

and local capacity building needs and effectively coordinated with other donor efforts to minimize overlaps or redundancies. Throughout the work planning process, new information was received and processed almost on a daily basis. A number of key workshops and milestones also influenced the direction of the US IOTWS Program, including:

- Scoping trip visits to Thailand (Sept. 15-16), Indonesia (Sept. 19-20), Sri Lanka (Sept. 26-27) and India (Sept. 21-23);
- Completion of the Consolidated IOC report and convening of the IOC meeting in Hyderabad in December 2005;
- US IOTWS Program Donor Coordination Workshop January 30-31, 2006.

A key component to the work plan is the inclusion of a detailed communications plan, discussed in section 2.6.4 below.

2.6.2 Support to USG Agency Representatives

The PI has provided continued support to the US IOTWS Program team members to facilitate the exchange of information, coordinate complementary activities, and provide a forum to discuss outstanding issues. The PI uses various communication and coordination tools such as the Program Coordination Group (PCG) that provides day-to-day team coordination and supports regularly scheduled meetings (conference calls). In addition, the PI created a team workspace on the US IOTWS Program website using the software Simplify that enables team members to post documents, hold online discussions, review team travel, and create topic-specific list-serves.

2.6.3 External Coordination and Communication with Program Partners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In addition to the immediate USG team members, there are additional program partners that the team interacts with regularly in order to communicate US IOTWS Program activities to a larger audience and to help establish coordination and partnership mechanisms for targeted program activities.

The US IOTWS Program team engages UN agencies and other donors in a variety of ways to promote coordination and complementarity of activities, avoid duplication of effort, and seek opportunities for partnering on targeted IOTWS activities. In an effort to bring together external partners, the US IOTWS Program held two coordination workshops—the first during September 12-14, 2005 and the second during January 29-31, 2006—that included separate sessions to engage participants from donor organizations and other partners. In January 2006 the PI conducted a needs assessment and gap analysis to identify opportunities to broaden/strengthen donor coordination as well as developing approaches to secure additional leverage that can be generated from the US IOTWS Program.

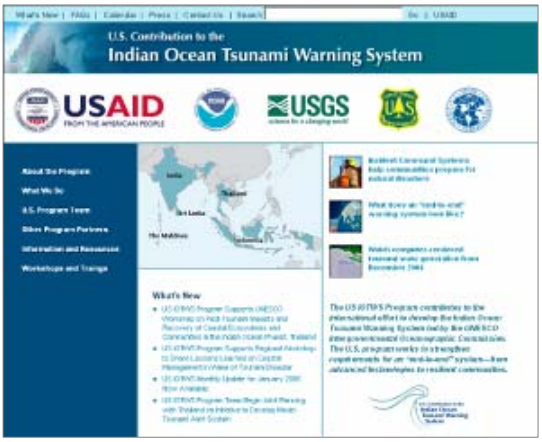
As a result of a call for more action on strengthening national and local level tsunami warning capability during ICG/IOTWS-II, the second coordination workshop in January 2006 focused attention on critical

national and local priorities. Delegates included more than 65 representatives from the UN Office of the Special Envoy for Tsunami Recovery, the IOC, WMO, United Nations Development Program, and leading U.S. federal agencies, multilateral and bilateral donors, and NGOs involved in developing tsunami warning systems in the region. One outcome from the workshop included the development of a collaborative training program by the USGS and the IOC to be held in the region. The January workshop also established and strengthened important relationships in the donor community. For example, NOAA staff met with UNESCO in March 2006 to explore opportunities for coordinating more closely on the regional IOTWS design. The US IOTWS Program also initiated direct discussions with UNESCAP on how to direct the $12.5 million Tsunami Trust Fund it is managing, and explored future opportunities for engaging the UN Office of the Special Envoy for Tsunami Recovery in program activities.

2.6.4 Outreach and Communications Program Developed and Implemented

The US IOTWS Program communicates with various partners that are directly relevant to the success of the US IOTWS Program, and more broadly inform various stakeholders and the public on program progress. Because there are several audiences both within and outside the US IOTWS Program, the team has developed several different types of products to target messages and information effectively. The PI prepared the US IOTWS Program Communications Plan as an appendix to the US IOTWS Integrated Program Work Plan (Appendix C) as required under Task 10 of the PI contract. The Communications Plan includes the overall goals for communication strategy, identification of various audiences that need to be reached with information, mechanisms to reach these audiences, and specific formats that will be developed. In addition, the Communication Plan includes various procedures for coordination among the team members and external partners. The Communications Plan was delivered to USAID on November 11, 2005.

US IOTWS Program Website. In October 2005, the PI developed the initial architecture for the US IOTWS Program website. The website provides users with up-to-date information on issues related to the development of the IOTWS, a library of information and resources, topic-specific fact sheets, contact information for partners throughout the Indian Ocean region, and a calendar of upcoming events. The PI provided training to US IOTWS Program team members and staff responsible for managing the website and the website was finalized and launched in November 2005. The program website serves as the primary communication tool both for the project team as well as external audiences. The website is updated weekly to provide a calendar of upcoming events, notification of new information that has been posted, and additions to an extensive library of resources.



Fact Sheets. The PI developed an overall program brochure that provides an overview of the various activities to be conducted by the program team. In addition, the PI has prepared a series of fact sheets about different aspects of the program such as DART technology, ICS, TARNS, Integrated Coastal Management, and CCR.

Monthly Updates. To inform partners of all major program developments, the PI prepares a two-page monthly update that is distributed electronically to more than 725 partners and stakeholders in the region and worldwide. This update includes a summary of key activities from the past month, based on weekly update submissions to RDM/A, as well as highlights of upcoming events.

In addition to the US IOTWS Program monthly updates, the PI submits information to be included in other periodic journals such as the United Nation's International Strategy for Disaster Reduction (ISDR) updates. This helps to disseminate information about the US IOTWS Program to a larger audience.

Press Releases, Talking Points, and Presentations. The PI developed press releases, talking points, and PowerPoint presentations as requested by USAID. For example, the PI developed talking points for the opening remarks by the RDM/A Director, Tim Beans, at both the September 2005 and the January 30 US IOTWS Program coordination workshops. The PI wrote a press release and talking points for the TARNS signing ceremony between USAID and the NDWC in March 2006.

2.6.5 External Resources Leveraged

Between August 2005 and March 2005, the program team leveraged more than $3.5 million that directly supports US IOTWS Program objectives towards development of an end-to-end IOTWS. This leverage is attributed to financial and in-kind contributions by the UN, the private sector, national governments, and academic institutions, and agreements with bilateral donors. The program team plans to focus significant attention on potential leverage in the next six month reporting period as programming decisions are made regarding the $12.5 million UNESCAP fund and the United Kingdom Department for International Development (DFID) £7.5 million set-aside funding for the tsunami warning system.

2.7 PROGRAM AREA SEVEN: SMALL GRANTS PROGRAM

The US IOTWS Program Small Grants Program, managed by the PI, has $750,000 to allocate in grant agreements by August 31, 2006. The Small Grants Manual was completed and approved by USAID in March 2006, together with a Request for Applications (RFA). Following approval by RDM/A, the Small Grants Manual was posted on the US IOTWS program website and the RFA distributed widely to program partner organizations.

M. FRIEDMAN, USAID RDM/A

Under the small grants program, local nongovernmental organizations will receive funding to conduct activities that directly contribute to the achievement of the US IOTWS Program results in a sustainable and tangible way such as capacity building and technical assistance, including training exercises at the local and community level.

An initial announcement about the Small Grants Program was distributed at the January 30–31, 2006 donor coordination meeting. In addition, ADPC and the PI's country coordinators distributed the pre-notification to organizations in their networks throughout the region. The PI began receiving preliminary abstracts from four of the five US IOTWS focus countries within weeks of the January coordination meeting. All abstracts received were later considered in the first round of competitive grant applicant review. All SGP awards are expected to be completed and activities launched during the next reporting period.

SECTION 3
PERFORMANCE MANAGEMENT PLAN REPORTING

The US IOTWS Program directly contributes to USAID's Special Objective 498-045 to save lives and support government-led early warning and disaster preparedness efforts in the Indian Ocean region. The program provides strategic support towards the development of an operational IOTWS through technical support of USG agency partners. The roles and responsibilities of all USG agency partners and the Program Integrator are described in the Integrated Program Work Plan along with planned implementation activities. The Performance Management Plan (PMP) describes the results framework, data collection sources and methods, and performance indicators and targets for the US IOTWS Program. The PI prepared the Integrated Program Work Plan and PMP (Work Plan Appendix B) as required under Task 10 of the PI contract. These were delivered to USAID on November 11, 2005. As part of the work plan, the PI also submitted an annex summarizing donor activities and contacts.

S. ROSS, USAID RDM/A

The US IOTWS Program monitors its progress through a results framework to ensure its activities are ultimately contributing to USAID's special objectives of saving lives and supporting the government-led early warning and disaster preparedness efforts in the Indian Ocean region.

The information presented below represents results achieved for the first eight-month period of the US IOTWS Program, August 1, 2005 to March 31, 2006. Because of the inherent challenges with initiating new activities at the country-level, it was not expected that the targets outlined in the PMP would be met during the first reporting period. However, the US IOTWS Program is well-positioned to meet its targets for most of the indicators at the end of the first year of the program.

The US IOTWS Program is building on the momentum created from the first eight months of the program. Several changes have been made in the organizational structure of the team to strengthen the ability to achieve sustainable results at the local level. For example, the PI has assigned country coordinators for each of the target countries in the region to help improve communications between the regional and country partners, assist with implementation of the small grants program, and coordinate the US IOTWS Program activities within each country.

3.1 RESULTS FRAMEWORK

The results framework for the US IOTWS Program falls under Special Objective 498-095 and directly supports SpO Intermediate Result (IR) 3, Early Warning System Established. The results framework consists of five Sub-Intermediate Results (Sub-IRs) and eleven indicators, four of which are incorporated directly from the SpO results framework (see Figure 3a).

Figure 3a. US IOTWS Program Results Framework

Special Objective (SpO 498-045): To save lives, help individuals rejoin the workforce and return to communities; support host government-led reconstruction and early warning/disaster preparedness efforts.

PROGRAM –LEVEL INDICATORS

Sub-IR1: Scientifically sound design for IOTWS developed

Indicator 1.1: Conceptual design for early warning system design accepted

Indicator 1.2: Protocols, agreements, ad products developed by ICG/IOTWS member nations to ensure interoperability of the regional IOTWS system

Sub-IR2: Tsunami detection and early warning capabilities improved

Indicator 2.1: Regional-level tsunami detection and communication system components (core stations) installed, deployed, or upgraded

Indicator 2.2: National- and local-level tsunami detection system components integrated into the IOTWS and operated in accordance with IOTWS standards and criteria

Sub-IR3: National capacity in tsunami warning dissemination and disaster management improved

Indicator 3.1: Tsunami/all hazards warning dissemination and disaster management system components designed, developed or improved at the national level

Indicator 3.2: Number of communities included in national alert systems (SpO Indicator 3.2)

Indicator 3.3: Number of government agencies that received technical support (SpO Indicator 4.1)

Sub-IR4: Local preparedness and coastal mitigation for tsunamis and related hazards improved

Indicator 4.1: Number of communities trained in disaster preparedness (SpO Indicator 3.1)

Indicator 4.2: Coastal communities initiating activities that support tsunami resiliency

Indicator 4.3: Kilometers of coastline under improved, sustainable environmental management (SpO Indicator C)

Sub-IR5: Private and public resources leveraged for the USG Program

Indicator 5.1: US$ leverage through private sector, NGO, donor, and public sector resources in support of the development of an end-to-end IOTWS

3.2 INTERMEDIATE RESULTS ACHIEVED

Specific results are reported in detail in Tables 3a through 3e, and Table 3f summarizes the results achieved in each of the five target countries in the region. Each table includes a description of illustrative targets for each indicator as outlined in the PMP..[1] These illustrative targets will be reviewed and adjusted prior to the completion of the Annual Report for FY2006. Results that have been achieved between August 2005 and March 2006 are briefly summarized as follows.[2]

- **Indicator 1.1: Conceptual design for early warning system design accepted**
    - draft and final versions of conceptual IOTWS design provided to ICG/IOTWS in 2005.

[1] The planned targets have been corrected to reflect the totals shown in the PMP.

[2] All USG agency partners, USAID, and PI have contributed to the preparation of this semi-annual update of PMP results for the US IOTWS Program. The PI has compiled results and other inputs through March 31, 2006 from USG agency partners.

- **Indicator 1.2: Protocols, agreements, and products developed by ICG/IOTWS member nations to ensure interoperability of the regional IOTWS system.**
    - 2 protocols for sea-level station upgrades in Indonesia
    - 4 protocols for sharing of seismic data
    - 1 consolidated report of national assessments
- **Indicator 2.1: Regional-level tsunami detection and communication system components (core stations) installed, deployed or upgraded.**
    - 2 sea level upgrades in Indonesia through NOAA support
    - 9 upgrades of seismic stations
- **Indicator 2.2: National- and local-level tsunami detection system components integrated into the IOTWS and operated in accordance with IOTWS standards and criteria.**
    - 2 sea level networks integrated
    - 1 Concept of Operations integrated into NDWC through USTDA-supported project
- **Indicator 3.1: Tsunami/all hazards warning dissemination and disaster management system components designed, developed or improved at the national level.**
    - 1 Concept of Operations designed and developed for NDWC through USTDA-supported project
- **Indicator 3.3: Number of government agencies that received technical support.**
    - 30 central government agencies representing the five target countries received technical support as well as 4 municipal agencies
- **Indicator 5.1: US$ leveraged through private sector, NGO, donor and public sector resources in support of the development of an end-to-end IOTWS.**
    - Approximately $3.5 million leveraged

3.2.1 Sub IR1: Scientifically Sound Design for IOTWS Developed

At the regional level, many of the US IOTWS Program activities are directly supporting the IOC process and have made great strides in supporting the development of the overall regional warning system. Because it is an IOC-led process, the rate of progress is somewhat determined by the frequency of scheduled meetings and the ability of member delegations to come to agreement and take action on key issues. However, many of the US IOTWS Program team members that participate in the ICG working groups have met country representatives outside of the formal process to further the discussions regarding the regional warning system.

The US IOTWS Program is on track to meet its targets for Indicators 1.1 and 1.2. The draft conceptual design of the IOTWS was presented at the ICG/IOTWS-I meeting in Perth, Australia in August 2005 and the final design was delivered to WG2 at the ICG/IOTWS-II meeting in Hyderabad, India, in December 2005. For Indicator 1.2 NOAA established agreements with BAKOSURTANAL (Indonesia) for the flow of data from two upgraded sea-level stations to GTS. USGS established several agreements and protocols to enable the flow of data from seismic stations in Sri Lanka, Indonesia, and Thailand. Several more protocols and agreements will be in place by the end of FY06, particularly in regard to sea-level networks, seismic stations, and communication upgrades.

Table 3a. Results for Sub-IR1: Scientifically Sound Design for IOTWS Developed.

Indicator 1.1: Conceptual design for early warning system design accepted			
FY	**Target**	**Actual**	**Explanation**
06	2	2	NOAA and USGS: (2) The target has been met for Indicator 1.1. The draft conceptual design of the IOTWS was presented at the ICG/IOTWS-I meeting in Perth, Australia in August 2005. A refined design, based on input received in Perth and additional analyses, was presented to Working Group 2 in Hyderabad, India, in December 2005.
07	None		

Unit of measure: Draft and final versions of conceptual IOTWS design provided to ICG/IOTWS.

Description: Conceptual IOTWS design serves as regional baseline to guide development of national systems. Draft and final versions provided through ICG/IOTWS. The conceptual design includes location for detection devices, protocols for sharing information/data essential channels of communications and other elements.

Relevance: Provides scientifically sound basis for design of IOTWS, specifically for use by ICG/IOTWS member states.

Targets: One draft design and one final design.

Data source: US delegations to IOC meetings.

Indicator 1.2: Protocols, agreements, and products developed by ICG/IOTWS member nations to ensure interoperability of the regional IOTWS system			
FY	**Target**	**Actual**	**Explanation**
06	10	7	NOAA: (2) NOAA reached agreement with BAKOSURTANAL for the upgrade and operations and maintenance of two sea level stations in Indonesia (Sabang and Sibolga). USGS: (4) USGS has a written data exchange agreement with the Sri Lankan Geological Survey and Mines Bureau; a verbal agreement with the Indonesian Bureau of Meteorology and Geophysics and the Lembaga Ilmu Pengetahuan Indonesia (Institute of Sciences); and a verbal agreement with the Thai Meteorological Department. PI: (1) The PI delivered the *Consolidated Report for 16 Countries Affected by the 26 December 2004 Tsunami* to the IOC in October 2005.
07	22		

Unit of measure: Number of protocols, agreements or products adopted (as a result of direct US assistance) developed and adopted by ICG/IOTWS member states.

Description: Protocols, agreements, and products includes reporting standards, performance criteria, and data access standards to insure interoperability of the various tsunami detection components (seismic networks, sea level networks, tsunami detection buoys, and communication networks, such as upgrades GTS, national communications networks).

Relevance: Protocols, agreements and products provide the basis for interoperability of each component in the IOTWS and provides the basis for establishing a functional end-to-end early warning system at a regional level.

Illustrative Targets:

NOAA: 11 protocols/agreements (6 for sea level; 2 for DART; 2 for communication upgrades; 1 WAN);

USGS:10 protocols/agreements, (5 letters of intent, 5 agreements on standards for detection and communication – most to be completed in FY06);

PI: 1 product (*Consolidated Report for 16 Countries Affected by the 26 December 2004 Tsunami*)

Data source: US IOTWS Program Team, IOC, NDMOs.

3.2.2 Tsunami Detection and Early Warning Capabilities Improved

The US IOTWS Program has already exceeded its target for Indicator 2.1 and is on track for meeting its target for Indicator 2.2. Several tsunami detection system components have been installed and upgraded throughout the region and the US IOTWS Program will continue to integrate these systems using the IOC standards and criteria. These components refer to the upgrades of several seismic stations and sea-level networks that transmit and interpret seismic and oceanographic data to determine the likelihood of a seismic-generated event.

Table 3b. Results for Sub-IR2: Tsunami Detection and Early Warning Capabilities Improved.

Indicator 2.1: Regional-level tsunami detection and communication system components (core stations) installed, deployed, or upgraded.			
FY	**Target**	**Actual**	**Explanation**
06	10	11	NOAA: (2) NOAA has upgraded two BAKOSURTANAL sea-level stations in Sabang and Sibolga, Indonesia. These stations, now part of the IOC GLOSS network, provide real-time monitoring of water levels for tsunami detection and warning purposes throughout the region. USGS: (9) USGS has upgraded 9 seismic stations on the Indonesian island of Sumatra and the forearc close to the tsunamigenic subduction zone. This work has been done in cooperation with Lembaga Ilmu Pengetahuan Indonesia (LIPI-the Institute of Sciences.)
07	25		
Unit of measure: No. of tsunami detection and communication system components (as a result of direct and indirect US assistance). *Description:* Tsunami detection and communication system components include seismometers, geodetic instruments (GPS), tide gauges, DARTs, and GTS upgrades identified as core stations in the regional conceptual plan design (Indicator 1.1). *Relevance:* These elements are essential to detect tsunami and transmit data to tsunami warning centers. *Illustrative Targets:* NOAA: 11 sea level gauges and upgrades – (Maldives, Sri Lanka, potentially India), 2 DART buoys, 2 country GTS upgrades (Maldives, Sri Lanka), and 1 communications system (WAN, Thailand) USGS: 9 components (seismic stations and/or related equipment, upgrade GPS stations) *Data source:* US IOTWS Program Team, NDMOs, other contractors working on equipment installation or protocols.			
Indicator 2.2: National- and local-level tsunami detection system components integrated into the IOTWS and operated in accordance with IOTWS standards and criteria			
FY	**Target**	**Actual**	**Explanation**
06	15	3	NOAA: (2) The two BAKOSURTANAL sea-level stations in Sabang and Sibolga, Indonesia, on the island of Sumatra, have been integrated into the IOTWS. These stations, now part of the IOC GLOSS network, provide real-time monitoring of water levels for tsunami detection and warning purposes throughout the region. USTDA: (1) CONOPS integrated into NDWC.
07	22		

Unit of measure: Number of components (core stations) integrated into national systems and according to IOC standards

Description: National tsunami warning systems integrated into the regional system.

Relevance: Installing detection hardware alone does not produce a functioning system. This indicator measures the number of functioning core stations (seismometers, geodetic instruments (GPS), tide gauges, DART buoys, communications networks) integrated and contributing to an overall end-to-end tsunami early warning system.

Illustrative Targets:

NOAA: 6 integrated components associated with sea level gauges (i.e., Maldives, Sri Lanka, potentially India), 2 integrated components associated with DART buoys, 2 integrated components associated with country GTS upgrades (Maldives, Sri Lanka), and 1 integrated component associated with communications systems (WAN, Thailand);

USGS:11 integrated components associated with seismic stations and/or related equipment (2 in India, 6 in Indonesia, 1 each in Sri Lanka, Thailand and Maldives);

USTDA: TBD

Data source: US IOTWS Program Team; NDMOs

3.2.3 National Capacity in Tsunami Warning Dissemination and Disaster Management Improved

The US IOTWS Program is on making progress to meet its targets for Indicator 3.1. A significant level of investment in terms of time and resources has been expended by the US IOTWS Program team to lay the groundwork with several of the national governments in the affected countries. Many of the US IOTWS Program activities that were initiated in the first six months focused on building awareness of the program or activity, and getting buy-in from the various partners. Much of this has now been completed, especially for the ICS and TARNS programs, so that the next six months will focus more on the implementation and integration of these efforts into the national disaster management programs. By taking this time up front, the team has enhanced the likelihood of a sustained commitment on the part of the countries involved. For example, the US IOTWS Program team required several consultative visits with the government of Sri Lanka over the course of four months before reaching agreement to move forward with integrating an Incident Command System within their overall disaster management program.

The US IOTWS Program did not record any results for Indicator 3.2, number of communities included in national alert systems. This indicator will be achieved once the national disaster management organizations in each of the five target countries have developed protocols and systems to link communities to a national network. The US IOTWS Program is intensively working with Thailand and Sri Lanka to strengthen their national networks and it is anticipated that substantial progress will be made by the end of FY06. During FY07, the CCR initiative is also expected to have significant impact in strengthening community-level integration into national warning systems.

The US IOTWS Program exceeded its target for Indicator 3.3 to provide technical support to central governments. This was due to the numbers of national-level ministries already being engaged and involved in training activities in many of the target countries (see Table A-1 in Appendix A for a complete listing of governments and municipalities). Because the technical discussions have necessarily needed to occur at a national level in the initial stages of the program, the numbers for municipalities is predictably low.

Table 3c. Results for Sub-IR3: National Capacity in Tsunami Warning Dissemination and Disaster Management Improved.

Indicator 3.1: Tsunami/all hazards warning dissemination and disaster management system components designed, developed or improved at the national level.

FY	Target	Actual	Explanation
06	20	1	USTDA: (1) operational CONOPS at NDWC achieved.
07	44		

Unit of measure: Number of dissemination components

Description: Tsunami/all hazards warning dissemination and disaster management system components include: organizational (leadership/operational) structures; enabling policies to ensure NDMOs possess authority and resources for decision making and response; communication systems for warning dissemination (TARNS, RANET); warning dissemination and disaster response processes and protocols; training program/drills; and resource centers at national, provincial, and local institutional levels, as appropriate.

Relevance: This indicator measures the warning dissemination and disaster management components that need to be in place to communicate warnings at national levels and to the last kilometer and to respond to disasters.

Illustrative Targets:

Organizational structure components *(a) multi-hazard leadership, (b) operational structure; (c) enabling policies:*

NOAA: 2 CONOPS: 1 for a regional center and 1 for a national center

USDA/FS: 4 components: 3 for ICS (a,b,c) in Sri Lanka; 3 for TARNS (a,b,c) in Thailand;

USTDA: 1 component: operational CONOPS at NDWC, Thailand;

PI: 5 enabling policy components for NDMOs (one in each country)

Warning dissemination components:

NOAA: 4 components: 3 RANETs for Sri Lanka, Maldives, Indonesia; 1 Wide Area Network for Thailand

USTDA: 3 components: communication system designs in each focus country to link national warning centers with regional and local systems;

Procedures/protocol components:

USGS: 6 components (Indonesia);

USDA/FS: 6 components; ICS Sri Lanka (3 levels of government) and TARNS in Thailand (3 levels of government);

Training program/drills components:

Targets for TARNS will be captured under USDA/FS.

USDA/FS: 11 components: 9 (8 training courses and 1 simulation exercise) for ICS in Sri Lanka; 2 simulation exercises for TARNS in Thailand

Resource center components:

USDA/FS: 2 components: 1 in Sri Lanka (SLIDA); 1 in Thailand (Interagency Work Group)

Data source: US IOTWS Program Team, NDMOs, other relevant organizations.

Indicator 3.2: Number of communities included in national alert systems.

FY	Target	Actual	Explanation
06	400/ 250,000	0	See narrative above.
07	800/ 500,000		

Unit of measure: (a) Number of communities (as a result of direct and indirect US assistance); and (b) estimated total population of those communities.

Description: An international warning system will be linked to vulnerable communities so that they can be alerted in advance. Interventions at the national level to capacitate national warning centers and connect them to

communities will be used to identify connected communities. Communities are defined as 100 households of 5 persons (500 persons on average) and located in tsunami vulnerable areas counted will be those communities with a functional warning system that are connected directly to the national alert system.

Relevance: Communities vulnerable to disasters will be notified earlier and thus able to take steps to protect themselves.

Illustrative Targets: Based on 20 percent of the tsunami vulnerable communities in the coastal areas of the 5 countries of the US IOTWS Program.

Data source: USG agencies and PI extrapolate based on information from National Emergency Operations centers.

Indicator 3.3: Number of government agencies (e.g. central government offices/municipalities) that received technical support.

FY	Target	Actual	Explanation
06	15/30	30/4	30 municipal governments and 4 municipalities. (See Table A-1 in Appendix A, listing all the central and municipal governments that received technical support in the first 8 months of the program.)
07	30/60		

Unit of Measure: Number of (a) central government and (b) municipal government agencies receiving technical assistance (as a result of direct and indirect US assistance).

Description: Technical assistance to government agencies includes all forms of training, consultant time, technology transfer, preparation of plans and other forms of assistance that capacitate the agency in EWS and disaster preparedness. An inventory of government agencies receiving technical support will be maintained by each country for each activity.

Relevance: The primary mode of technology transfer through the US IOTWS Program will be through capacitating national and local government agencies

Illustrative Targets: Targets assume an average of 3 national and 6 local agencies per country per year.

NOAA: TBD

USGS: 8 central government agencies (2 in Indonesia; 2 in India; 3 in Thailand; 1 in Sri Lanka);

USDA/FS: 45 local government agencies

USTDA: TBD

Data source: US IOTWS Program Team

3.2.4 Local Preparedness and Coastal Mitigation for Tsunamis and Related Hazards Improved

Local level activities of the US IOTWS Program will take the longest to initiate, both as a result of the need to first work with national-level government agencies and organizations, but also as a result of deliberate efforts to promote the greatest degree of sustainability for the actions implemented. The CCR initiative combined with the small grants program is the primary vehicle that will be used to achieve many of the results under Sub-IR4, Local Preparedness and Coastal Mitigation for Tsunamis and Related Hazards Improved. While there are currently no results to report under this IR, the US IOTWS Program is actively working with leading stakeholders in each of the five target countries to develop and implement a rigorous training program for communities. These training programs are currently scheduled for the August-September 2006 timeframe so that results will begin to be reported either at the end of FY 2006 or in the first quarter of FY 2007.

As of March 2006, the small grants program was just being approved by USAID. In the next reporting period the small grants program will be well underway with anticipated awards for grants totaling approximately $750,000 dollars, representing the entire small grants budget. These locally-led efforts will also greatly enhance the ability to achieve results under Sub-IR4.

Table 3d. Results for Sub-IR4: Local Preparedness and Coastal Mitigation for Tsunamis and Related Hazards Improved.

Indicator 4.1: Number of communities trained in disaster preparedness			
FY	**Target**	**Actual**	**Explanation**
06	500	0	
07	1,000		

Unit of measure: No. of communities (as a result of direct and indirect US assistance)

Description: The number of communities will be based on the number of government officials, NGOs, and local leaders trained in disaster preparedness and the communities represented or reached by these groups. The Coastal Community Resilience Program will be basis for disaster preparedness training and include benchmarks on local preparedness and coastal mitigation measures.

Relevance: By making citizens more aware of emergency procedures, the impact of disaster can be mitigated

Illustrative Targets: Based on projected training courses and workshops in project countries that will contribute to disaster preparedness.

NOAA: 200 people representing 200 communities in 5 countries;

USGS: 100 people representing 100 communities in 5 countries;

PI: 200 people representing 200 communities in 5 countries.

Data source: The number of people trained will be based on TraiNet database populated by attendance sheets from each workshop and training session and disaggregated by gender.

Indicator 4.2: Coastal communities initiating activities that support coastal community resilience.			
FY	**Target**	**Actual**	**Explanation**
06	20	0	See narrative above.
07	40		

Unit of measure: No. of communities (as defined in Indicator 3.2) aware of and initiating activities to build tsunami resilience (as a result of direct and indirect U.S. assistance).

Description: Benchmarks in tsunami resilience will be developed based on the US TsunamiReady program for countries throughout the Indian Ocean Region as the Coastal Community Resilience (CCR) Program guide. This guide will be developed and disseminated to coastal communities (villages, large municipalities, resort industry). Training and workshops on CCR Program will be conducted with organizations and agencies working directly with coastal communities in each focus country and in collaboration with the IOC.

Relevance: By organizing communities to adopt appropriate disaster preparedness measures, the impact of tsunamis and other disasters can be mitigated.

Illustrative Targets: Targets include communities that receive the CCR Guide and orientation session, communities represented by organizations receiving CCR TOT, and CCR Program pilot communities.

Data source: US IOTWS Program Team

Indicator 4.3: Kilometers of coastline under improved, sustainable environmental management.			
FY	**Target**	**Actual**	**Explanation**
06	50	0	See narrative above.
07	200		

Unit of measure: Kilometers of shoreline under improved, sustainable environmental management (as a result of direct and indirect US assistance).

Description: Kilometers of shoreline under improved, sustainable environmental management captures the ecosystem component of tsunami resilient communities. This indicator is derived from the kilometers of coastline associated with Indicator 4.2.

Relevance: Well-managed and/or natural coasts with ecosystems intact such as coral reefs, mangroves, and beaches are less vulnerable to disaster from flooding and storms. Shorelines where development is controlled and set back from the beach are also less vulnerable to human displacement. Effective integrated coastal management is a critical part of local preparedness because it provides for order in coastal development and brings a planning process that anticipates potential disaster situations.

Illustrative Targets: Targets are derived values based on potential pilot areas where local and/or national governments have expressed interest to address issues of improved coastal management in areas that were affected or are vulnerable to tsunami and related events. On average, one community may represent 5 km of shoreline.

Data source: Data from government bodies that is responsible for coastal management, NGOs, and US IOTWS Program Team.

3.2.5 Private and Public Resources Leveraged for the USG Program

The target of a 3:1 ratio of direct and indirect leveraging was set by USAID based on the total US IOTWS Program budget of $16.6 million. This ambitious target was set based on the sheer volume of recovery and rehabilitation funding that poured into the region after the tsunami. The US also anticipated having a significant influence in decision-making on the IOTWS via the IOC and directly with country governments developing IOTWS components. (See Table A-2 in Appendix A for a complete breakout of leveraged amounts.)

An important contribution to the IOTWS was the August 2005 and January 2006 public release by NOAA of all technical specifications for DART buoys. In response to escalating demand for this technology, the information provided on NOAA's website has already been considered by several countries in their domestic efforts to develop DART-like buoy systems, and was used by Malaysia to develop its first of three buoys deployed in March 2006 through a private contractor, at an initial cost of nearly $1 million. This station was designed using NOAA specifications that were released over the Internet. NOAA's contribution significantly reduced the design and development process that enabled the systems to be deployed very quickly and at a much lower cost than would have otherwise occurred.

Additionally, the US IOTWS Program leveraged a substantial amount of in-kind contributions, such as salaries, donations of in-kind support from the IOC and other countries and organizations, as well as through Memoranda of Agreements with the Government of Australia and with the California Institute of Technology (CalTech). Several non-cash contributions are also attributed to in-kind U.S. expertise that is being provided as part of participation with IOC ICG/IOTWS working groups.

The US IOTWS Program did not secure any private sector leverage, or direct leverage from the UN or bilateral donors during the first six months. Nevertheless, team members have initiated discussions with several key partners such as the Tsunami Trust Fund facilitated by UNESCAP with initial contributions from the governments of Thailand ($10 million) and Sweden ($2.5 million), AusAID, the UK Department for International Development (DFID), GTZ, and the Japanese International Cooperation Agency (JICA). The program team members have identified several specific activities in which the private sector could

support the program and will be developing a strategy to pursue these funding streams in the next six months.

Table 3e. Results for Sub-IR5: Private and Public Resources Leverage for the USG Program.

Indicator 5.1: US$ leveraged through private sector, NGO, donor, and public sector resources in support of the development of an end-to-end IOTWS			
FY	**Target**	**Actual**	**Explanation**
06	$24.9M	$3.5M	See Table A-2 in the appendix for a detailed breakdown of leverage achieved.
07	$49.8M		

Unit of measure: US$ millions (aggregated by source; reporting will specify source)

Description: The US IOTWS Program will strive to interact with other donors, programs and organizations, both public and private, to coordinate efforts and to identify support that can complement and augment that of the US IOTWS Program. All USG partner efforts, including those of USTDA, will be captured under this measure. As used for this measure, directly leveraged funding includes: (1) funding leveraged for joint IOTWS activities from other public and private partners, including national or sub-national host country governments; (2) funding for activities in which the IOTWS program developed enabling policies, regulations, or provided pre-investment support; (3) obligated or committed funding for direct follow-on programs of multi-lateral or bilateral donors, NGOs, or the private sector; or (4) USAID Global Development Alliance or Development Credit Authority investments; or (5) other USG-leveraged funding not originating from the tsunami emergency supplemental budget. USAID bilateral projects will not be included, although leveraged funding for those projects that directly supports IOTWS objectives may be reported.

Relevance: Leveraged support will increase the overall impact and effectiveness of a regional system that depends on many different sources of support to make it fully functional and durable in time

Illustrative Targets: Target of 3:1 direct and indirect leveraging has been set by USAID based on the total US IOTWS Program budget of $16.6 million.

Data source: Donor programs, private and public sector, other sources as appropriate

Table 3f. Summary of Program Results Achieved by Target Country through March 31, 2006.

Indicator	Country					
	Indonesia	Sri Lanka	Thailand	India	Maldives	Regional
Sub-IR1: Scientifically sound design for IOTWS developed						
Indicator 1.1: Conceptual design for early warning system design accepted	n/a	n/a	n/a	n/a	n/a	2
Indicator 1.2: Protocols, agreements, and products developed by ICG/IOTWS member nations to ensure interoperability of the regional IOTWS system	4	1	1	-	-	1
Sub-IR2: Tsunami detection and early warning capabilities improved						
Indicator 2.1: Regional-level tsunami detection and communication system components (core stations) installed, deployed, or upgraded	11	-	-	-	-	-
Indicator 2.2: National- and local-level tsunami detection system components integrated into the IOTWS and operated in accordance with IOTWS standards and criteria	2	-	1	-	-	-
Sub-IR3: National capacity in tsunami warning dissemination and disaster management improved						
Indicator 3.1: Tsunami/all hazards warning dissemination and disaster management system components designed, developed or improved at the national level	6	-	1	-	-	-
Indicator 3.2: Number of communities included in national alert systems (SpO Indicator 3.2)	-	-	-	-	-	-
Indicator 3.3: Number of government agencies that received technical support. Central government/municipality (SpO Indicator 4.1)	7/1	14/1	3/1	2/1	4/0	-
Sub-IR4: Local preparedness and coastal mitigation for tsunamis and related hazards improved						
Indicator 4.1: Number of communities trained in disaster preparedness (SpO Indicator 3.1)	-	-	-	-	-	-
Indicator 4.2: Coastal communities initiating activities that support coastal community resilience	-	-	-	-	-	-
Indicator 4.3: Kilometers of coastline under improved, sustainable environmental management (SpO Indicator C)	-	-	-	-	-	-
Sub-IR5: Private and public resources leveraged for the USG Program						
Indicator 5.1: US$ leverage through private sector, NGO, donor, and public sector resources in support of the development of an end-to-end IOTWS (in US$ thousands)	$209	$45	$31	-	-	$3,237

APPENDIX A

Table A-1. Breakdown of Technical Support Provided to Central Governments and Municipalities

Country	Central Governments	Municipalities
India	1. National Disaster Management Division, Ministry of Home Affairs 2. Department of Ocean Development, GOI	1. Planning Commission, Tamil Nadu
Indonesia	3. National Coordination Board for Disaster Management BAKORNAS 4. National Survey and Mapping Agency (BAKOSURTANAL) 5. Meteorological and Geophysical Agency (BMG) 6. Ministry of State for Research and Technology (RISTEK) 7. Ministry of Marine Affairs and Fisheries (DKP) 8. Indonesian Institute of Science (LIPI) 9. Agency for Assessment and Application of Technology (BPPT)	2. Aceh Provincial Environmental Impact Agency
Maldives	10. Department of Meteorology, Ministry of Home Affairs, Housing and Environment 11. Ministry of Defense, National Security Service (NSS) 12. Ministry of Environment 13. Ministry of Planning and National Development	
Sri Lanka	14. Ministry of Fisheries and Aquatic Resources 15. Ministry of Education, Sri Lanka 16. Ministry of Disaster Management and Human Rights 17. Ministry of Home Affairs 18. Ministry of Healthcare and Nutrition 19. Ministry of Mass Media and Information 20. Ministry of Public Administration and Home Affairs 21. Ministry of Environment 22. Ministry of Disaster Relief and Services 23. Ministry of Urban Development and Water Supplies 24. Ministry of Local Government and Provincial Councils 25. Information and Communication Technology Agency of Sri Lanka 26. Ministry of Highways 27. Ministry of Provincial Councils and Local Government	3. Sarvodaya Disaster Management & Mitigation
Thailand	28. Ministry of Interior 29. Ministry of Mineral Resources and Environment 30. National Disaster Management Center (NDWC)	4. Phuket Tourism Authority and Phuket Government

Table A-2. Funds Leveraged for US IOTWS Program, August 1, 2005–March 31, 2006.[3]

Month/ Year	Source	Program Area	Amount	Country Supported	Notes
08/05–03/06	USGS	2	$113,000	Regional	Installation of upgrades to existing Malaysia seismic stations: $30K, installation of two new broadband stations: $60K, software upgrades to process new data: $15K, Satellite links to two new stations: $8K
08/05–present	NOAA	2	$350,000	Regional	Upgrades to tide gauge stations in the Indian Ocean Region by the IOC. In addition to the 10 USAID-funded tide station upgrades that will be completed under the US IOTWS Program, as of March 31, the IOC has upgraded 7 additional stations which will help strengthen the overall impact from the US IOTWS Program. (each station costs roughly $25k in equipment costs and $25k in salary for staff) The NOAA Climate Observations Program is also leveraged to reduce the cost substantially of both USAID and IOC-funded station upgrades.
09/05–04/06	USDA/FS	3	$18,000	Sri Lanka	Cost-share from national governments for ICS and TARNS workshops and related activities in Sri Lanka and Thailand
			$15,000	Thailand	
09/05–03/06	National and local govts, NGOs	2, 3, 4	$555	Indonesia	Salaries paid for 463 person days spent in workshops (assuming $50/day)
			$9,435	Sri Lanka	
			$555	Thailand	
			$555	India	
			$370	The Maldives	
			$11,680	Regional	
09/05–03/06	Cal Tech	2, 3	$200,000	Indonesia	Work agreement with Caltech for seismic and GPS monitoring in Indonesia
11/05	NOAA	3	$10,480	Regional	Participation of NOAA employees, Canadian experts, and local managers to the November 2005 TARNS workshop (includes salary and travel costs)
11/05	UNESCO	1	$60,000	Regional	Conducted seismic training workshop in Xi'an, China with participants from the Indian Ocean region to enhance capacity for seismic detection and forecasting. Cost sharing was done for salaries and travel costs.
12/05	NOAA	3	$3,950	Thailand	Estimated donated salary for NOAA employee while in Thailand to conduct TARNS scoping visit

[3] The leveraged amounts were calculated by the individual agencies and provided to the PI. The backup information used to derive the numbers is available from the PI.

Month/ Year	Source	Program Area	Amount	Country Supported	Notes
12/05	NOAA	2	$900,000	Regional	Malaysia was the first Indian Ocean nation to deploy deep ocean tsunami detection stations. The private sector design is based on the specifications and engineering design information NOAA release publicly under its contribution to the USG program. The value of that contribution in research and development costs avoided, time saved, and cost of acquisition reduced is approximately $900K ($500K new reach and development, $400K reduced cost for three stations.
1/06	USDA/FS	3	$9,320	Regional	4 weeks donated salary for 2 USDA/FS experts
01/06–03/06	USGS	2	$9,000	Indonesia	In-kind/cost share for salaries, travel costs, contributions by Chile for paleoseismology exchanges
			$9,000	Sri Lanka	
			$12,000	Thailand	
			$22,500	Regional	
01/06–present	USGS	2	$118,000	Regional	Operation of NEIC and its contribution of data to the PTWC. These costs included IT/Security Support (0.25 FTE, fractional parts of several people); Operations Support (0.25 FTE, D. Mason and J. Mayer); 24x7 IT Support (off-hours; fractional cost, 0.25 FTE); Leased Circuit (T1 line, Golden, CO-Patrick AFB, Florida); and Facilities and Equipment Cost (Annualized).
01/06–present	NOAA	1	$757,580	Regional	Contribution of the PTWS and ITIC operating costs. Includes PTWC salaries (30%), ITIC salaries (100%), Pacific Region staff (including regional staff assigned to ITIC and those directly involved in the US IOTWS program) (30%). Includes $202,350 in non-labor (travel, other support costs devoted or related to support for the USG IOTWS program)
02/06	USDA/FS	3	$9,320	Sri Lanka	Salary contribution of 2 USDA/FS employees for a two –week period in January for the ICS Brainstorming Workshop and subsequently, contributed salary of 4 USDA/FS employees for 1 week for a domestic cadre meeting to prepare for the Basic/ Intermediate ICS training.
			$9.320	Regional	
3/06	Government of Australia	1, 2, 3, 4	$875,000	Regional	An MOA between NOAA and Australia has expanded the capacity of Australia to contribute to the technology transfer and exchange, acquisition of systems, modeling, and conceptual design of the IOTWS.
		TOTAL	$3,524,620		

APPENDIX B
LIST OF US IOTWS PROGRAM AND REFERENCE DOCUMENTS

Table B-1. List of Program Documents

No.	Name of Document	Sources
1.	US IOTWS Integrated Program Work Plan	www.us-iotws.gov
2.	US IOTWS Program Scoping Trips to Thailand, Indonesia, Sri Lanka, India and Maldives	www.us-iotws.gov

Table B-2. List of Fact Sheets

No.	Name of Document	Sources
1.	DART Buoy Technology for Tsunamis and Other Coastal Hazards – 02/06	www.us-iotws.gov
2.	Developing a Tsunami Alert Rapid Notification System (TARNS) in Asia – 02/06	www.us-iotws.gov
3.	Incident Command System – February 2006	www.us-iotws.gov
4.	Integrated Coastal Management for Disaster Mitigation – February 2006	www.us-iotws.gov
5.	Coastal Community Resiliency – March 2006	www.us-iotws.gov
6.	The US IOTWS Program Summary	www.us-iotws.gov

Table B-3. List of Presentations

No.	Name of Document	Sources
1.	USDA Forest Service Training and Support Services for ICS – Deanne Shulman, USFS	www.us-iotws.gov
2.	Coastal Resilience through Integrated Coastal management	www.us-iotws.gov
3.	ICS Incident Management Teams as Practiced in the U.S. – Michael Lohrey, USDA/FS	www.us-iotws.gov
4.	ICS National Training and Qualifications System as Practiced in the U.S.	www.us-iotws.gov
5.	Incident Command System (ICS) as Practiced in the U.S. – Dave Summer, USDA/FS	www.us-iotws.gov
6.	Indian Experience for Integrating the ICS into the Disaster Management System – Rajiv Michra, Lal Bahadur Shastri National Academy of Administration, India	www.us-iotws.gov
7.	Presentation: Program Coordination Workshop – ADPC	www.us-iotws.gov
8.	Program Coordination Workshop – IOC	www.us-iotws.gov
9.	Program Coordination Workshop – UNDP	www.us-iotws.gov
10.	Program Coordination Workshop – USG	www.us-iotws.gov
11.	Program Coordination Workshop – USTDA	www.us-iotws.gov
12.	Program Coordination Workshop – WMO	www.us-iotws.gov
13.	Workshop Background, Objectives, and Incident Command System Overview – Deanne Shulman, USDA/FS	www.us-iotws.gov
14.	USDA Forest Service Training and Support Services for ICS – Deanne Shulman, USDA/FS	www.us-iotws.gov

Table B-4. List of Manuals

No.	Name of Document	Sources
1.	Small Grants Program Manual	www.us-iotws.gov

APPENDIX C
LIST OF US IOTWS PROGRAM MEETINGS, TRAININGS, WORKSHOPS, STUDY TOURS, AND SPECIAL EVENTS

Table C-1. List of Meetings Conducted by US IOTWS Program Team from August 1, 2005 to March 31, 2006 in INDONESIA

Organizations	Description of Meetings
BAKORNAS (National Coordinating Board for Disaster Management and Internally Displaced Persons/Refugees)	09/05 PI – Meeting with Director of Disaster Mitigation to identify needs during scoping trip.
BAKOSUTANAL (National Survey and Mapping Agency)	09/05 PI – Meeting with Dr. Parluhutan during scoping trip to identify assistance and needs.
BMG (Meteorological and Geophysical Agency – Geophysical Data Information Center)	09/05 PI – Meeting with BMG during scoping trip to identify assistance and needs.
Delft Hydraulics	03/06 PI/S.Tighe – Meeting with Deepak Vatvani regarding the project in Aceh.
DHV (Consulting and Engineering firm)	03/06 PI/S.Tighe – Meeting with Dick Jansen from Netherland regarding program in Aceh.
Embassy of Germany, Jakarta	09/05 PI – Meeting with Michael Rottmann on TWS support during scoping trip.
International Federation of Red Cross and Red Crescent Societies (IFRC) and Indonesia Red Cross (PMI)	090/5 PI – Meeting with IFRC and PMI to identify leveraging opportunities and create partnership during scoping trip.
Masyarakat Penggulangan Bencana Indonesia (MPBI) (Indonesia Society for Disaster Management)	03/06 PI/S.Tighe – Meeting with MPBI to collect information on the new National Disaster Management Law to be reviewed in Parliament.
Minister of State for Research and Technology (MENRISTEK)	09/05 PI – Meeting with MENRISTEK to identify training support in seismic detection and technology during scoping trip.
Mercy Corps	03/06 PI/S.Tighe – Meeting with Mercy Corps to gain information about their community project near Padang funded by Bill Gates Foundation.
Ministry of Marine Affairs and Fisheries (MMAF)	09/05 PI – Meeting with Stacey Tighe and DG of MMAF to exchange information about CZM and resilient community work during the scoping trip. 03/06 PI/S.Tighe – Meeting with MMAF to collect information and brainstorm about support for and collaboration on their existing programs.
UNESCO	09/05 PI – Meeting with UNESCO to gain information about general donor coordination support.

Table C-2. List of Meetings Conducted by US IOTWS Program Team from August 1, 2005 to March 31, 2006 in THAILAND

Organizations	Description of Meetings
Asian Disaster Preparedness Center (ADPC)	09/05 PI – Meeting with Executive Director and ADPC staff to enhance relationship, refine SOW and look for small grant and leveraging opportunities. 10/05 PI – met with ADPC to finalize arrangement for collaboration in the IOTWS.
Department of Disaster Prevention and Mitigation (DDPM)	10/05 PI – Meeting to gather information prior to visits from USFS and NOAA regarding TARNS. 12/05 – USDA/FS Meeting for orientation to TARNS. 10/05 – USDA/FS Meeting to introduce TARNS.
Department of Mineral Resources (DMR)	03/06 PI/Fakhruddin – Meeting on "Tsunami Risk Mitigation Measures with Focus on Land Use and Rehabilitation.
European Commission: Directorate General for Humanitarian Aid – ECHO	01/06 PI/A.White – Meeting to exchange information and explore collaboration opportunity.
German Technical Agency (GTZ)	09/05 PI – Meeting with GTZ to explore collaboration opportunity.
The International Union for the Conservation of Nature and Natural Resources (IUCN), Thailand	02/06 PI/Fakhruddin – Meeting with Dr. Janaka De Silva to discuss Green Project in Thailand.
Japan International Cooperation Agency (JICA)	09/05 PI – Meeting with Tamura Eriko for regional coordination and invitation of JICA to TARNS activity.
Livelihood Program, Asian Institute of Technology (AIT)	12/05 PI/USFS – Meeting regarding IOTWS support of 4 participant to the Lessons Learned in Recovery: Post Tsunami Relief and Rehabilitation for Sustainable Coastal Development. 12/05 PI/Fakhruddin – Attending the Ranong Capacity Development Livelihood Program.
National Disaster Management Center (NDWC)	09/05 – Signing ceremony of the USTDA agreement with NDWC to assist in enhancing the communication system. 09/05 PI – Meeting with NDWC to invite participation to IOTWS trainings and workshops. 10/05 PI – Meeting to gather information prior to visits from USFS and NOAA regarding TARNS. 11/05 PI/USFS – Meeting with NDWC team to prepare for MOA and TARNS workshop. 01/06 PI/USFS/NOAA – Consultation with NDWC in preparation for first TARNS workshop. 02/06 PI/USGS – Meeting with NDCW to confirm choosing of seismic stations as part of warning system network. 02/06 PI/Fakhruddin – Attending Concept of Operations Workshop. 02/06 PI/Fakhruddin/A. White – Attending the International Workshop on Post-Disaster Assessment and Monitoring of Changes in the Coastal, Ocean and Human Systems in the Indian Ocean and Asian Waters. 03/06 PI/USFS – Meeting with NDWC team on preparation of TARN workshop.
Phuket Tourism Authority and Phuket Government	12/05 PI/USFS/NOAA – Meeting with NDWC re. TARNS.
Royal Norwegian Embassy, Thailand	09/05 PI/Fakhruddin – Meeting with Lasse Nymoen, Counselor to discuss about the finding of eight month fast track study on "Tsunami Risk Mitigation Measures with Focus on Land use and Rehabilitation".

Organizations	Description of Meetings
Thailand Meteorological and Geological Service	09/05 PI – Meeting with Deputy Director General and Chief of Seismological Bureau to explore the collaboration opportunities as part of scoping trip. 10/05 PI – Meeting to gather information prior to visits from USFS and NOAA regarding TARNS. 02/06 PI/USGS – Meeting with TMD to confirm which seismic stations will become part of warning system. 12/05 USDA/FS/NOAA – preliminary meeting to establish role in TARNS.
United Nations Development Program (UNDP)	09/05 PI – Meeting with UNDP for regional coordination. 01/06 PI – A.White met with Sanny to exchange program information.
United Nations: Economic and Social Commission for Asia and the Pacific (UNESCAP)	03/06 PI/USAID – Meeting on Multi-donor Voluntary Trust Fund on Tsunami Early Warning System Arrangements in the Indian Ocean and Southeast Asia.
University of Rhode Island	10/05 PI – Meeting with A.Bart, P.Rubinoff, and W. Dudley to discuss their subcontract under PI-IOTWS. 12/05 – Meeting with USDA/FS and NOAA to arrange visits to field sites.
Wetlands International	02/06 PI/Fakhruddin – Meeting with Ms. Marie-Jose Vervest to discuss assessment of earthquake and tsunami affected areas to support small grant program through local NGOs, CBOs and community groups under the green coast project.
World Agency of Planetary Monitoring and Earthquake Risk Reduction (WAPMERR)	02/06 PI/Fakhruddin – Meeting with Dr. Khatuna Janjalia to discuss database for disaster management in the Indian Ocean.

Table C-3. List of Meetings Conducted by US IOTWS Program Team from August 1, 2005 to March 31, 2006 in INDIA

Organizations	Description of Meeting
Department of Ocean Development, Government of India	09/05 PI – Meeting with DOD to explore opportunity for collaboration and technical exchange.
Department for International Development, UK	09/05 PI – Meeting with DFID to collect information about DFID project in India during scoping trip.
Disaster Management Support (DMS) Project, USAID	09/05 PI – Meeting with Chief of Party for DMS project implemented by IRG during scoping trip.
National Disaster Management Division, Ministry of Home Affairs, Government of India	09/05 PI – Meeting with MOHA as nodal agency in disaster management in India to identify support needed.
Planning Commission, Government of India	09/05 PI – Meeting with Planning Commission to identify support on coastal zone protection/livelihood.
United Nation Development Programme (UNDP)	09/05 PI – Meeting with G. Padmanabhan, Emergency Analysis during scoping trip.
USAID/New Delhi	09/05 PI – Meeting with USAID to collect information on disaster management support project and GOI-UNDP DRM program in India during scoping trip. 02/06 PI/Subbiah – Discussion with USAID regarding CCR program and established coordination plan.
US Embassy	09/05 PI – Meeting with Science Office, Department of Defense, and Political Section during scoping trip.

Table C-4. List of Meetings Conducted by US IOTWS Program Team from August 1, 2005 to March 31, 2006 in the MALDIVES

Organizations	Description of Meeting
Department of Meteorology	10/05 PI/APDC – Meeting Ahmed Inaan to collect information about EWS in Maldives.
International Telecommunication Union	10/05 PI/APDC – Meeting to collect information about telecommunications system in Maldives.
Meteorological Department	03/06 PI/USAID/NOAA – Meeting with A.Algeen to discuss GTS communication links and data processing in Maldives for GTS upgrade plan.
Ministry of Defense, National Security Service (NSS)	10/05 PI/APDC – Meeting Lt. Col. Ibrahim Didi to collect information about national EWS in Maldives.
Ministry of Environment	03/06 PI/USAID/NOAA – Meeting with Environment Analyst to discuss coastal mitigation in general.
Telecommunication Authority of Maldives	10/05 PI/APDC – Meeting to collect information about telecommunications system in Maldives.
The Bandos Resort, Male	03/06 PI/USAID/NOAA – Meeting with Director of resort to interview on the tsunami experience and emergency response.
United Nation Development Programme, Maldives	10/05 PI/APDC – Meeting to collect information about UNDP supported projects in Maldives. 03/06 PI/USAID/NOAA – Meeting with UNDP to discuss UNDP supported program in resort sector and traditional island community sector in Maldives.

Table C-5. List of Meetings Conducted by US IOTWS Program Team from August 1, 2005 to March 31, 2006 in SRI LANKA

Organizations	Description of Meeting
CH_2MHill	12/05 PI – Meeting with CH_2Hill to establish coordination with USAID's CZM project. 02/06 PI/USAID/NOAA(Barrett) – Meeting with COP and Josh Moga for CCR and coastal mitigation effort. 04/06 USDA/FS and PI – ICS program synergies
Ceylon Chamber of Commerce	09/05 PI – Meeting with Secretary General/CEO to look for potential opportunity to strengthen network in tourism industry 02/06 PI/USAID/NOAA – Meeting with Ayoni Wanniganayake and others
Department of Coast Conservation	02/06 PI/USAID/NOAA – Meeting with R.A.D.B. Samaranayake, Director of CCD for information on coastal management activities and CZM plan of SL.
Disaster Management Center	09/05 PI – Meeting with DG for future collaboration to strengthen communication plan at national, district and village levels. 12/05 PI/A.White/A.Pakzad/D.Shulman – Meeting with Sri Lankan Government to prepare for the Incident Command System (ICS) Workshop in January 2006 and recruit local coordinator. 12/05 PI – Subbiah discussed the establishment of national coordination center in Colombo. 01/06 PI – Meeting with DG regarding the ICS Training of Trainers seminar in April. 01/06 USFS – Meeting to discuss next steps following the workshop and process for introducing and gaining approval from the government for the ICS program. 03/06 PI – Meeting with DG regarding coordination. 03/06 PI – Meeting arranged by the DMS to identify the need adopt a coordinated approach towards the preparation of Hazard Maps for Disaster Mitigation and Management.

Organizations	Description of Meeting
Disaster Management Division of the Sri Lanka Institute of Development Administration (SLIDA).	04/06 USDA/FS – Discussion of role of SLIDA faculty as train-the-trainers in ICS 01/06 PI – Orientation to SLIDA and potential role of SLIDA in integrating ICS into Sri Lanka system. 01/06 PI/USFS – Meeting regarding training of trainers of ICS in Sri Lanka and hand over the Concept paper for Introductory ICS training.
Ecosystem and Livelihood Group, IUCN, Sri Lanka	02/06 PI/Fakhruddin – Meeting with Dr. Sriyanie Miththapala to discuss the coastal zone restoration program in the east coast of Trincomalee, Batticoloa and Ampara in Sri Lanka.
Federation of Chambers of Commerce and Industry of Sri Lanka	09/05 PI – Meeting with President of FCCISL to invite participation in community projects and for leveraging support.
Geological Survey and Mines Bureau	12/05 P/USGS – Meeting to prepare training course on Application of Seismology to Tsunami Warnings. 01/06 PI/NOAA met with organization representative.
Government of Sri Lanka (Coast Conservation Department, Geological and Mines Bureau, Meteorological Department, National Science Foundation, National Building Research Organization, National Aquatic Resources Agency, Central Environment Authority, Urban Development Authority, the Task Force to Rebuild the Nation)	09/05 PI – Meeting with Early Warning System Committee during scoping trip to introduce the program and prioritize assistance and coordinate with agencies under EWS Committee.
Information and Communication Technology Agency of Sri Lanka	01/06 PI/NOAA – Meeting with Chairman V.K.Samaranayake.
IUCN Asia Regional Marine Programme, Coral Reef Degradation in the Indian Ocean and the Global Coral Reef Monitoring Network, South Asia	01/06 PI/Fakhruddin – Meeting to discuss small grant potential to consolidate the coastal marine database.
Meteorological Department	01/06 PI/NOAA – Meeting with representatives.
Ministry of Education, Sri Lanka	12/05 PI/Fakhruddin – Meeting with Secretary of Minister to plan for ICS workshop and discuss potential small grants.
Ministry of Disaster Management and Human Rights	01/06 PI/USDA/FS – Meeting with Major General Hettiarachchi and identify strategy and prepare for meeting with Minister. 02/06 PI – Meeting with the Secretary to the regarding arrangements for a Meeting in April for Secretaries of Ministries and Heads of Department regarding the IOTWS program in general and regarding ICS in particular.
NGOs in Sri Lanka (IFRC, American Red Cross, Sarvodaya, World Vision and Mercy Corps)	09/05 PI – Meeting with EWS Committee during scoping trip to introduce the program, share information and identify area of coordination in community-based activities. 01/06 USDA/FS – meeting with Consortium of Humanitarian Agencies (CHA) for introduction to ICS.
Sewa Lanka Foundation	02/06 PI/USAID/NOAA – met with Steve Francone, Monitoring and Evaluation Consultant.
Sri Lanka Institute of Local Government	01/06 PI – Orientation to ICS and its potential role as training of trainers in ICS program.
Technology Agency of Sri Lanka	01/06 PI/NOAA – Meeting with Professor V.K. Samaranayake, Chairman of ICTA.
University of Peradeniya	12/05 PI/Fakhruddin – Meeting to discuss potential small grants.
University of Moratuwa,	09/05 PI – Meeting with Department of Civil Engineering to seek for research collaboration as part of scoping trip. 01/06 PI/Fakhruddin – Meeting with Professor Hettiarachchai to finalize ICS workshop agenda.

Organizations	Description of Meeting
	01/06 PI/NOAA – Meeting with Professor Samanthan Hettiarachchi. 01/06 PI/Fakhruddin – Meeting with Professor Saman Bandara to provide some comments in his small grant proposal on "Evacuation planning for Tsunami endangered coastal towns in Sri Lanka". 01/06 PI/Fakhruddin – Meeting with Professor S.S.L.Hettirachchi to discuss small grant proposal on risk assessment case study. 01/06 PI – Meeting with Professor Hettirachchi to discuss next step for follow up workshop and process for introducing and gaining approval from GSL for ICS. 02/06 PI/USAID/NOAA – Meeting with Professor Hettiarachchai on post-tsunami data analysis and the use of Galle Town as pilot area for certain CCR in an urban setting.
U.S. Embassy, Colombo	09/05 PI – Meeting with Head of Economic and Commercial Affairs to seek general information on Sri Lanka and Maldives and to establish contact.
USAID/Colombo	09/05 PI – Meeting with USAID to discuss the development of SL National Disaster Management Center. 12/05 PI/USFS – Meeting on ICS Brainstorming workshop preparation. 01/06 PI/NOAA – Meeting with B.Kauffeld and A.Mallawatantri re NOAA activity. 01/06 PI – Meeting to discuss ICS agenda and details of workshop planning. 01/06 USDA/FS/PI – Debrief on ICS Brainstorming Workshop 02/06 P/USAID/NOAA – Meeting with USAID for suggestion on geographical area of IOTWS activities.
UNICEF	03/06 PI – Meeting on Data Capture for Disaster Management at the Department of Census and Statistics, Sri Lanka.
UNU-EHC, Germany	02/06 PI/Fakhruddin – Meeting with Dr. Fabrice Renaud to discuss the impacts of mangrove destruction on vulnerability in Sri Lanka.
United Nation Development Program (UNDP)	10/05 USDA/FS – Integration of ICS in Road Map for disaster management in Sri Lanka

Table C-6. List of Trainings and Workshops from September 2005 to March 2006

Training	Organized by	Venue	Date	Participants/Countries
Training on Earthquake and Tsunami Geology	USGS	Santiago, Chile	01/25/06–02/17/06	Sri Lanka (1) Indonesia (2) Thailand (1)
Workshop	**Organized by**	**Venue**	**Date**	**Participants/Countries**
US IOTWS Program Planning and Coordination Workshop	PI	Bangkok, Thailand	09/14/05–09/15/05	International (37)
WG1 Meeting on Seismic Measurement, Data Collection and Exchange	IOC	Jakarta, Indonesia	11/10/05–11/11/05	Sri Lanka (1) Thailand (2)
Introductory Workshop "Incident Command System for Disaster Management"	USDA/FS	Colombo, Sri Lanka	01/11/06–01/12/06	Sri Lanka (47) India (1 facilitator)
US IOTWS Program Coordination Workshop	PI	Bangkok, Thailand	01/30/06– 01/31/ 06	International (65)
Regional Post-Tsunami Lessons Learned Workshop for Sustainable Coastal Management	AIT - USAID Post-Tsunami project/ URI	Pathumthani (AIT), Thailand	02/15/06–02/17/06	India (1) Sri Lanka (1) Maldives (1) Indonesia (1)
International workshop on Post-Disaster Assessment and Monitoring of Coastal Ecosystems, Biological and Cultural Diversity in the Indian Ocean and Asian Waters	UNESCO-IOC	Phuket, Thailand	02/20/06/– 02/24/06	India (1) Sri Lanka (1) Maldives (1) Indonesia (1)